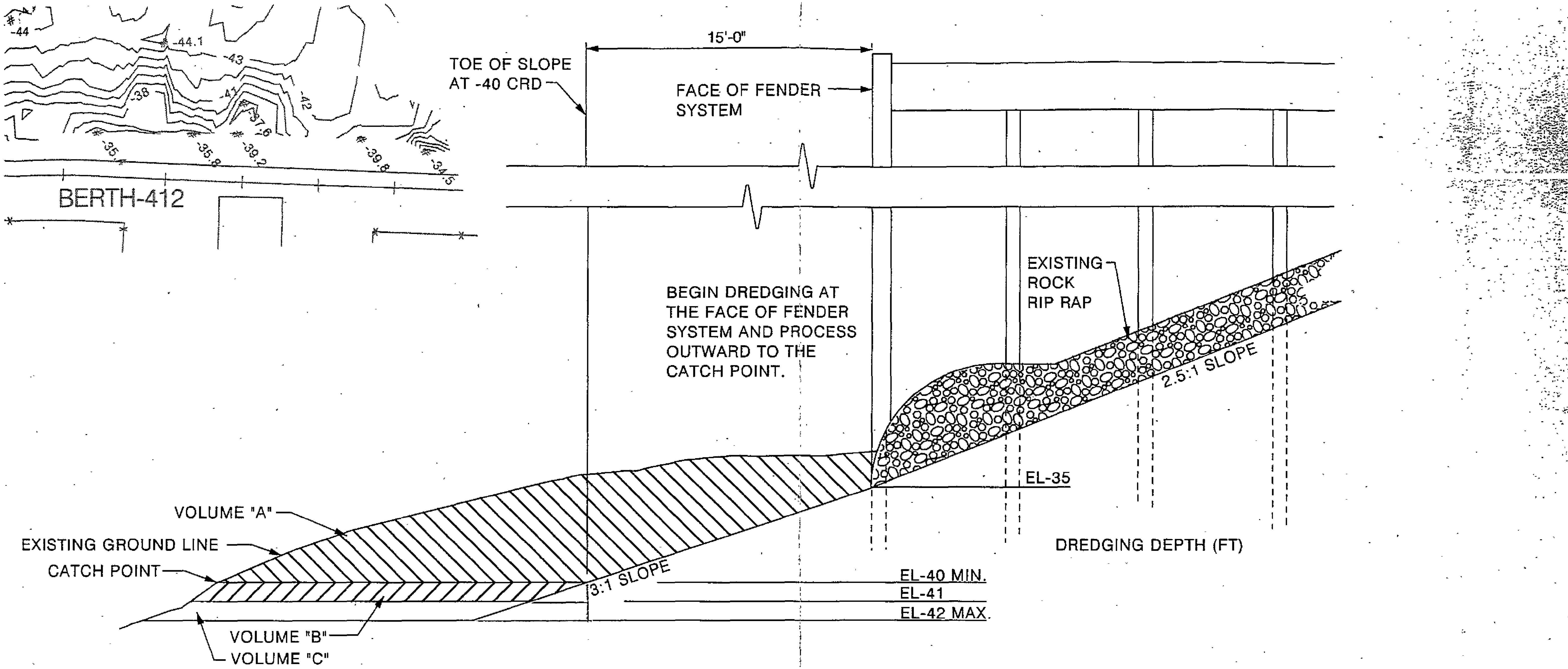


TYPICAL SECTION (2 / C-1)

SCALE: 1" = 5'-0"

AS BID

RTLAND EGON	REGISTERED PROFESSIONAL ENGINEER 13,903 OREGON MARCH 16, 1988 MICHAEL J. EATON	DESIGNED BY	M. EATON / N. LOOS	TERMINAL 4
NAGER		DRAWN BY	P. SHIELDS	BERTH 410 / 411
		CHECKED BY	M. EATON	**MAINTENANCE DREDGING** PLAN AND SECTION
52051 PROJECT NUMBER	EXP: 12/31/97	DATE	JULY 1997	SUBMITTED BY: M. Eaton, PROJECT ENGINEER
		SCALE	AS SHOWN	DRAWING NO. T4 97-2 1/1 (C-1)

MICROFILMED

T4T90000002526

Quinn, Padraic (Pad)

From: Quinn, Padraic (Pad)
Sent: Monday, July 07, 1997 2:57 PM
To: Futornick, Katherine (Kathi)
Cc: Jones, Stanton K. (Stan) (POPMAIL)
Subject: RE: Pencil Pitch Cleanup

No, the plan was not updated to include the changes. However, Hart-Crowser has put together an abbreviated sampling plan which answers the concerns that you raised last week. I have not seen a copy of it yet but will by tomorrow. I will send a copy to Stan when I get it.

From: Futornick, Katherine (Kathi)
To: Quinn, Padraic (Pad)
Cc: Degens, Sebastian; Hachey, John; Halladay-Hunt, Debra; Hrdlicka, Robert (Bob); Jones, Stanton K. (Stan); Malloy, Fay Marie (Fay); Ring, Jeffery (Jeff)
Subject: RE: Pencil Pitch Cleanup
Date: Monday, July 07, 1997 3:27PM

Has Hall-Buck updated the plan you sent me last week? I'll be out of the office until Monday so please work with Stan to make sure that the details of the cleanup plan are incorporated into the revision.

From: Quinn, Padraic (Pad)
To: Hrdlicka, Robert (Bob)
Cc: Degens, Sebastian; Futornick, Katherine (Kathi); Hachey, John; Halladay-Hunt, Debra; Jones, Stanton K. (Stan); Malloy, Fay Marie (Fay); Ring, Jeffery (Jeff)
Subject: Pencil Pitch Cleanup
Date: Monday, July 07, 1997 3:07PM

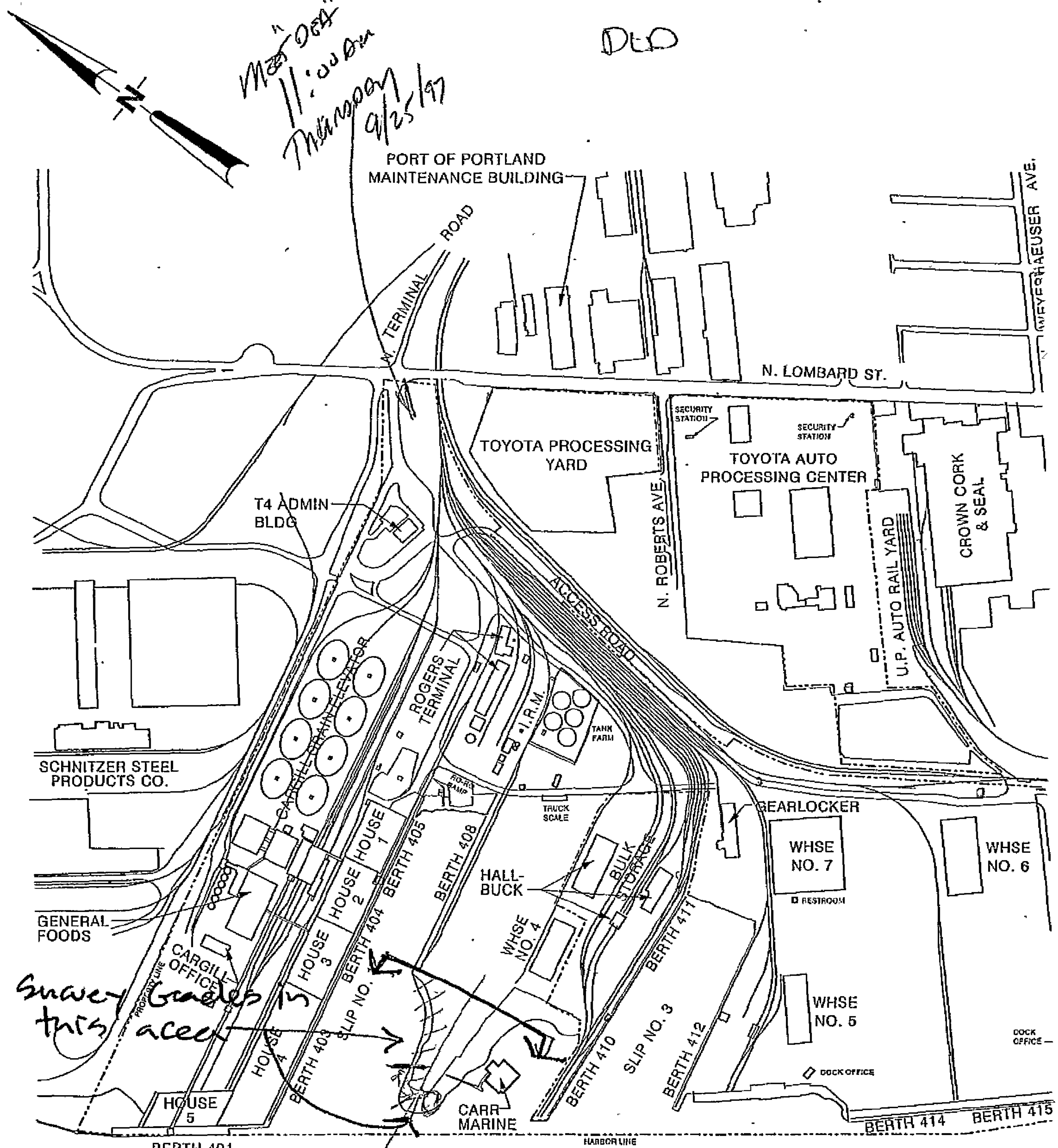
Cleanup of the spilled pencil pitch at Slip 3 has begun. This morning Hall-Buck had Foss and a dive company on site to start removing material that was spilled during the June 18th incident. The plan is to vacuum the pencil pitch, sediments and water onto the dock for recovery and let the water drain into the on-site settling pond. Success has been variable throughout the day with some pump problems and limitations on the amount of time the divers are able to stay at depth without decompressing. Some pencil pitch has been recovered but from spill estimates there should be a lot more to come out.

The next pencil pitch ship is scheduled to come in tomorrow evening so the plan is to have all cleanup work done by the end of business tomorrow. I'll keep you posted on the progress and follow-up sampling results.

DEMO MATSON WAREHOUSE.

DEQ

Met "DEQ" 11:00am Thursday 9/25/97



Survey Grades in this area

Project # 60019

Call with questions

Thanks Tim 7208

DATE : APR 1997

10-JUN-1997 13:51
ROSEG
e:\marine\t4\dwgs\97\3000.dgn

Redacted

T4T900002528

DEPARTMENT OF THE ARMY
PORTLAND DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2946
PORTLAND, OREGON 97208-2946

December 11, 1997

REPLY TO
ATTENTION OF:

Operations, Construction,
and Readiness Division

SUBJECT: Permit Application ID No: 8760

Port of Portland
Attn: Dana Siegfried
P. O. Box 3529
Portland, Oregon 97208-3529

Dear Ms. Siegfried:

We have received your request to modify your original permit. You are proposing to place up to 10,000 cubic yards of sediments dredged from Terminal 4, Berth 410/411 (mile 4.5 of the Willamette River, Portland, Multnomah County, Oregon), within the Ross Island Lagoon. Dredging is scheduled to occur in January 1998.

We have evaluated your proposal and have coordinated with State and Federal resource agencies; no objections were received. We are, therefore, granting your request subject to the following special conditions:

a. Dredging and disposal shall occur as described in the document "Dredged Material Disposal Plan for the Department of Environmental Quality Terminal 4, Berth 410/411 Maintenance Dredging Project 52051, November 1997". A minimum three foot cap shall be placed over the dredged material.

b. The Port of Portland shall abide by conditions outlined in a letter from Michael Llewelyn, Oregon Department of Environmental Quality (DEQ), to Judy Linton, U. S. Army Corps of Engineers, dated October 20, 1997.

c. Monitoring shall occur at the dredge and disposal sites to ensure turbidity level increases are minimized. Recommendations have been made by DEQ in a letter to Kathi Futornick, dated December 5, 1997, as to how this monitoring should be done.

d. This authorization for disposal within the Ross Island Lagoon applies only to material dredged from Berth 410/411 during the January 1998 cycle; it does not apply to other maintenance dredging activities authorized under the subject permit.

Please be aware that all other terms and conditions of the original permit remain in full force and effect.

If you have any questions about this modification, please contact Ms. Judy Linton, Regulatory Project Manager, at the above address, or telephone (503) 808-4382.

BY THE AUTHORITY OF THE SECRETARY OF THE ARMY:

Judy L. Linton
for Robert T. Slusar
Colonel, Corps of Engineers
District Engineer

Copies Furnished:

ODSL (Hedrick)
ODEQ (Rosetta)

Quinn, Padraic (Pad)

From: Quinn, Padraic (Pad)
Sent: Wednesday, December 17, 1997 11:05 AM
To: Hachey, John; Ring, Jeffery (Jeff); Futornick, Katherine (Kathi)
Cc: Hrdlicka, Robert (Bob); Degens, Sebastian; Siegfried, Dana; Halladay-Hunt, Debra
Subject: Pencil Pitch Spill

The latest on the Hall-Buck pencil pitch spill.

1217PP.DOC

MEMORANDUM

Date: December 17, 1997

To: John Hachey
Jeff Ring
Kathi Futornick

From: Pad Quinn

cc: Bob Hrdlicka
Sebastian Degens
Dana Siegfried

Re: Update on Hall-Buck Pencil Pitch Spill

Based on a written request from Hall-Buck, DEQ has decided to allow Hall-Buck to postpone the cleanup of the spill of pencil pitch which occurred on June 23, 1997 at T4 Berth 411. Loren Garner of the DEQ stated that after conversation with the Cleanup Group at DEQ (Steve Fortuna & Dave St Louis), they did not feel that impacts to the environment would change if the cleanup was done by the end of August 1998 as opposed to January 1998. Loren also stated that now DEQ will have control over a total cleanup of the slip this summer as opposed to not being involved in that portion at all.

Hall-Buck's original request argued that doing cleanup during low water would be safer and have a less likely chance of turbidity reaching the main channel during the project, the pitch is insoluble in water and that they were probably going to conduct a more extensive cleanup when there lease expires in June, so economically it made sense. DEQ jumped at this offer because now they will require submittal of sampling plans, slip cleanup plans and be able to have oversight on the entire cleanup of the slip. Prior to this DEQ did not have a mechanism to be included. Hall-Buck had not expected nor considered this in their decision. After talking with Marie yesterday it also appears that Hall-Buck had not considered that the additional volume of material in this overall cleanup that will need a disposal site. The spilled material was headed for the landfill for disposal but with DEQ leading disposal away from Ross Island, taking all material from a larger cleanup to the landfill will be costly.

Loren said that he was in the process of writing up the DEQ's decision and would have it out next week. In talking to him he said the cleanup level "in the interim" for pencil pitch will remain at 0.5%, as the consent decree states, but DEQ would be looking at the science of this decision and may determine that a lower level would be more appropriate for the full cleanup of the slip. This obviously would have huge impact on us including any future work we do in this slip. I asked Loren how EPA fit into DEQ's overall decision to grant this delay and he stated that since the consent decree had expire that should not be an issue. After I told him the spill occurred while it was still in place, he said the decision was clearly made by the DEQ and that if EPA raised any concern it should be directed at the DEQ and not the Port or Hall-Buck. I am not convinced with his assurance but I made it clear to him that the Port has pushed for the immediate cleanup of this spill since it occurred, we do not concur with his decision to delay and that we expect his records to show our opposition.

Reasons for our objections to the delay include our obligation under the consent decree and the possibility of EPA's objection to this delay, the potential for distribution of pitch over a larger area in the slip due to tug and ship activity, and the lowering of the cleanup standard for pencil pitch which is the first of many actions that will be taken by DEQ now that T4 is in the middle of their radar screen. We could be faced with more pitch over a larger area but at a lower concentration, thus arguably absolving Hall-Buck from cleanup but leaving us with the responsibility if DEQ lowers the cleanup standard.

One possibility to determine if this delay allows redistribution of sediment is to set up some sediment monitoring traps which I am looking into now. If you have any suggestions or questions let me know. Upon receiving the letter from DEQ I will be talking to EPA about this delay.

I will continue to keep you updated as to how this proceeds.

1. HORIZONTAL DATUM: NAD-83 OREGON NORTH ZONE INT. FEET

2. CONTOURS ARE SHOWN IN FEET AND INDICATE DEPTHS BELOW COLUMBIA RIVER DATUM ZERO. THE TIDE BOARD MARKED TO 30 FEET THAT WAS USED IS LOCATED AT BERTH-412.

3. HORIZONTAL POSITIONS FOR NAVIGATION AND DATA COLLECTION WERE DETERMINED BY USING A TRIMBLE 4000SSE IN DIFFERENTIAL MODE RECEVING CORRECTIONS FROM THE (C.O.R.S.) STATION LOCATED AT APPLETON WASHINGTON

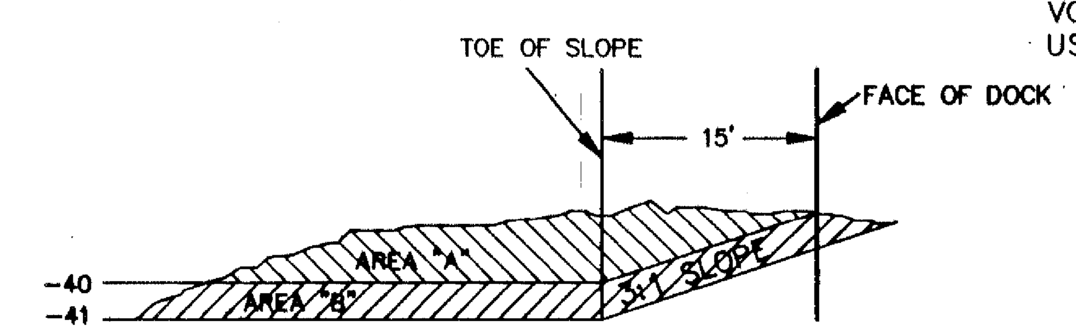
4. BATHYMETRIC DATA WAS COLLECTED USING AN INNERSPACE-448 ECHOSOUNDER WITH AN 8' SINGLE BEAM TRANSDUCER.

5. SURVEY DATA WAS COLLECTED LONGITUDINALLY WITH THE DOCK FACE USING A TWENTY-FIVE FOOT LINE SPACING. THE SURVEY DATA COLLECTED ALONG EACH SURVEY LINE WAS THINNED USING A "SHOAL BIAS" METHOD TO AN APPROXIMATE HORIZONTAL SPACING OF 5 FEET.

6. THERE MAY BE BOTTOM FEATURES THAT ARE NOT SHOWN ON THIS MAP BECAUSE OF THE LINE SPACING INTERVAL. THIS SURVEY DOES NOT INCLUDE BATHYMETRIC DATA BETWEEN THE ADJACENT SURVEY LINES.

7. THIS BATHYMETRIC SURVEY IS REPRESENTATIVE OF THE CONDITION OF THE RIVER BOTTOM AT THE TIME OF THE SURVEY BASED ON THE LINE SPACING INTERVAL AND THINNING METHOD USED. THE CONDITION OF THE RIVER BOTTOM MAY CHANGE AT ANY TIME AFTER THE DATE OF THIS SURVEY.

8. HYDROGRAPHIC SURVEY DATA COLLECTED: DECEMBER 16, 1997



NOT TO SCALE

VOLUME CALCULATIONS

VOLUMES WERE CALCULATED IN THE AREA AS SHOWN USING 3:1 SLOPES

VOLUME IN CUBIC YARDS

AREA "A" = 6110

AREA "B" = 1858

AREA A + AREA B = 6558

NO.	DATE	BY	REVISIONS	CK'D	APP'V'D	NO.	DATE	BY	REVISIONS	CK'D	APP'V'D

PORT OF PORTLAND
PORTLAND, OREGON

MINISTER-GLAESER SURVEYING INC.
2200 E. EVERGREEN BLVD.
VANCOUVER, WA 98661
(360) 694-3313

97D015 — DESIGN NUMBER
52051-100 — PROJECT NUMBER

REGISTERED PROFESSIONAL LAND SURVEYOR
OREGON
ROBERT W. GLAESER
12/22/97

DESIGNED BY
DRAWN BY G.P. BAIRD
CHECKED BY R.W. GLAESER
DATE DECEMBER 22, 1997
SCALE 1"=50'

TERMINAL 4

PRE-DREDGE HYDROGRAPHIC SURVEY
BERTHS 410 AND 411

SUBMITTED BY Charles E. Wiley — MANAGER SURVEY

DRAWING NO. T4 97-507 1/1 (C-1)

T4T9000025334

HARTCROWSER

Earth and Environmental Technologies

Sampling and Analysis Plan Sediment Testing for Full Characterization of Proposed Dredged Material Longview, Kalama, and Vancouver, Washington and Portland, Oregon

Prepared for
Port of Portland

Port Project No. 51773
Port Task No. 220

September 3, 1998
J-5760

T4T900002537

CONTENTS

T4T900002538

TABLES

FIGURES

APPENDIX

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SAMPLING AND ANALYSIS PLAN
SEDIMENT TESTING FOR
FULL CHARACTERIZATION OF PROPOSED DREDGED MATERIAL
LONGVIEW, KALAMA, AND VANCOUVER, WASHINGTON AND
PORTLAND, OREGON

1.0 INTRODUCTION

1.1 Project Description

In conjunction with the Army Corps of Engineers (Corps) proposed deepening of the Columbia River Navigation Channel, the local Port sponsors (Port of Portland, Vancouver, Kalama, and Longview) propose to conduct full characterization (FC) sediment studies at nine separate locations for the purpose of site specific sediment ranking of potential dredged material management units (DMMU). The FC studies will utilize Tier II physical and chemical sediment testing in accordance with the Draft Dredge Material Evaluation Framework for the Lower Columbia River Management Area (LCRMA) (Corps et al., 1998). Each proposed DMMU has water depths less than proposed navigational depths; therefore, dredging will be required to accommodate deeper draft vessels.

The proposed Columbia River deepening project will deepen both the Columbia and Willamette River navigation channels. The proposed depth for the Columbia River navigation channel is -43 feet (ft) Columbia River Datum (CRD) plus a 5 ft overdepth (-48 ft total depth); while the Willamette River navigation channel is proposed to be deepened to -43 ft CRD plus a 2 foot overdepth (-45 ft total depth).

The nine sites proposed for FC studies include:

Port Facility	Site	River
Port of Portland	Terminal 6	Columbia
	Berth 501	Willamette
	Berth 401	Willamette
	Irving Street Terminal	Willamette
	Louis Dreyfus Terminal (LDC)	Willamette
Port of Kalama	Peavey Grain Terminal	Columbia
	Harvest States Grain Terminal	Columbia
Port of Vancouver	United Grain Terminal	Columbia
Port of Longview	Longview Grain Wharf	Columbia

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At present, the navigation channel leading to each site is maintained to -40 ft CRD. As part of the channel deepening project, the Terminals on both the Columbia and Willamette Rivers will require berthing depths of -43 ft with a 2 ft overdredge allowance (-45 ft).

In addition, sampling and chemical analysis will be performed at 12 deep water locations in the Willamette River that were not sampled during the Corps' 1997 channel deepening feasibility study. The 12 deep water locations are proposed for reconnaissance level sediment characterization which will yield sediment chemistry data that is comparable to the Corps' previous work on the channel deepening feasibility study.

1.2 Site Descriptions

Site descriptions of each sampling location is given below. The general location of each sampling area is shown on Figure 1.

Terminal 6. Terminal 6 (T6) is located on the left bank of the Columbia River at river mile 102. T6 is the Port of Portland's major container facility. T6 handles containerized cargo and automobiles. Part of T6 was constructed in 1974 and additional construction occurred in 1980. T6 is routinely dredged to -41 ft CRD (including 1 ft of overdredge).

Berth 501. Berth 501 is operated by Columbia Grain, Inc. Berth 501 is located on the Willamette River at river mile 1.0 and is used for the receipt and shipment of grain. Berth 501 was constructed between 1974 and 1975 and is occasionally dredged to maintain berthing requirements of -41 ft CRD (including 1 ft of overdredge).

Berth 401. Berth 401 is operated by Cargill, Inc. and is used for grain and non-grain agricultural shipments. Berth 401 is located on the Willamette River at river mile 4.2 and was modernized in 1975. Berth 401 is occasionally dredged to maintain berthing requirements of -41 ft CRD (including 1 ft of overdredge).

Irving Street Terminal. The Irving Street Terminal is also operated by Cargill, Inc. and is used for grain shipments. The terminal located on the right bank of the Willamette River at River mile 11.5.

Louis Dreyfus Terminal. The Louis Dreyfus Terminal (LDC) is located on the right bank of the Willamette River at river mile 12. The LDC terminal is used for grain shipments. The LDC terminal is subject to scour and has little maintenance dredging history.

Harvest States Grain Terminal. The Harvest States Grain Terminal is located at river mile 77 on the right bank of the Columbia River in the Port of Kalama. The terminal is operated by Harvest States Cooperatives for the receipt and shipment of grain.

Peavey Grain Terminal. The Peavey Grain Terminal is located at river mile 73.8 on the right bank of the Columbia River. The terminal is operated by Peavey Co. for the receipt and shipment of grain. The Peavey Grain Terminal is subject to scour and majority of the berthing area is naturally maintained to below -50 ft CRD. Therefore, the Terminal has little maintenance dredging history.

United Grain Terminal. The United Grain Terminal is located on the Columbia River (river mile 103.5) in the Port of Vancouver. The terminal is used for receipt and shipment of grain. The United Grain Terminal is subject to scour and presently has berthing depths of at least -45 ft CRD.

Longview Grain Wharf. The Grain Wharf is located at the Port of Longview at river mile 66.4 on the Columbia River. At present the grain wharf is not in operation.

1.3 Previous Sediment Sampling

The Port of Portland has completed sediment quality characterization studies for Terminal 6 and Berths 501and 401. Previous sediment chemistry results from Terminal 6 and Berth 501 indicated that the material was suitable for unconfined aquatic disposal. These sediments have not been tested since 1993 and 1992, respectively. Sediments from Berth 401 have not been tested since 1982 and no regulatory approval was made at that time. The present sediment quality is unknown.

At present, there are no site specific sediment data for either the Irving Street or Louis Dreyfus Terminals.

There are no relevant sediment quality data for any of the other sampling sites.

2.0 PROGRAM OBJECTIVES

The sediment characterization study objectives are summarized below:

- Characterize sediments to be dredged in conformance with recently developed LCRMA requirements (Corps et al., 1998) to enable the

Corps, Oregon Department of Environmental Quality (DEQ), and Washington State Department of Ecology (Ecology) to Rank DMMU's;

- Develop sediment characterization information for inclusion in the Draft Feasibility Study for facilities that will-be deepened to benefit from the channel deepening project;
- Assess disposal option(s);
- Collect, handle, and analyze representative sediment core samples of the proposed dredging prisms in accordance with protocols and Quality Assurance/Quality Control (QA/QC) requirements outlined in LCRMA (Corps et al., 1998).

3.0 PROJECT TEAM AND RESPONSIBILITIES

The sediment characterization program will include: 1) project planning and agency coordination; 2) field sample collection; 3) laboratory preparation and analysis; 4) QA/QC management; and 5) final data report. Staffing and responsibilities are outlined below.

3.1 Project Planning and Coordination

Mr. Sebastian Degens, Port of Portland (Port), is the applicant's representative and the primary contact for administrative issues related to the Port's maintenance dredging program. Mr. Howard Cumberland of Hart Crowser's Oregon office will be the overall project manager responsible for developing and completing the sampling program, and the primary contact for technical issues related to this sampling plan and the sediment characterization report. Following plan approval by the Corps and DEQ, Mr. Cumberland will be responsible for timely and successful completion of the project. Mr. Cumberland will provide a copy of the approved sampling plan along with the Corps approval letter to all sampling and testing subcontractors, and coordinate any significant deviations from the approved sampling plan with the Corps and DEQ.

3.2 Field Sample Collection

Dr. John Herzog, Hart Crowser, Seattle, will provide overall direction and supervision to the field sampling program in terms of logistics, personnel assignments, and field operations. Dr. Herzog will supervise field collection of all the sediment core samples. He will also be responsible for assuring accurate sample positioning; recording sample locations, depths, and identification; assuring conformance to sampling and handling requirements including field decontamination procedures; photographing, physically evaluating, and logging the samples; and for chain of custody of the sample cores until they are delivered to the analytical laboratory.

3.3 Laboratory Preparation and Analyses

Mr. Cumberland will be responsible for coordinating the chemical laboratory analysis programs. He will also instruct the laboratories on the need to maintain required handling and analytical protocols, including detection limit requirements for sediment characterization. Mr. Cumberland will ensure that archived sediments are stored under proper conditions.

Ms. Teena Jones, Project Chemist at Columbia Analytical Services will be responsible for physical and chemical analysis. Columbia Analytical Services will handle and analyze the submitted samples in accordance with Corps analytical testing protocols and QA/QC requirements. A written report of analytical results and QA/QC data will be prepared by Columbia Analytical Services and included as an appendix in the final report.

3.4 QA/QC Management

Ms. Kym Anderson of Hart Crowser, Seattle, will serve as Quality Assurance Representative for the sediment characterization project. She will perform QA oversight for both the field sampling and laboratory programs. Ms. Anderson will stay fully informed of field program procedures and progress during sample collection, and laboratory activities during sample preparation and analysis. She will record and correct any activities that deviate from the written SAP. She will also review the laboratory analytical and QA/QC data to assure that data are valid and procedures meet the required analytical QC limits. Upon completion of the sampling and analytical program, Ms. Anderson will incorporate findings into a QA/QC report.

3.5 Final Data Report

Mr. Cumberland and Dr. Taku Fuji (Hart Crowser, Seattle) will provide technical oversight and review of the Final Data Report and the data analysis it contains. They will also be responsible for preparation of the Final Data Report, including

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descriptions of sample locations and depths; sampling, handling, and analytical methods; QA/QC; and compilation and interpretation of data.

4.0 SAMPLE COLLECTION AND HANDLING PROCEDURES

4.1 Definitions

The following definitions apply to this sampling program:

- **Surface and Subsurface Sediments.** Surface sediments include those encountered within 10 cm of the sediment/water interface and typically represent the active biological zone exposed to the majority of benthic organisms. Subsurface sediments are encountered at depths greater than 10 cm below the sediment/water interface and are largely removed from direct contact with benthic organisms.
- **Sediment Grab Sample.** A surface sediment sample that represents the upper 10 cm of the sediment column.
- **Sediment Core.** The entire cumulative length of sediment core extracted by the coring device. Typically, the recovered sediment length is less than the total penetration depth because of compaction during coring. Each sediment core is identified by number in Table 1.
- **Sampling Depth (Penetration Depth).** The entire cumulative depth of penetration of the coring device from the sediment/water interface.
- **Dredged Material Management Unit (DMMU).** The volume of dredged material for which a separate decision on suitability for unconfined open-water disposal can be made. DMMUs are represented by physical and chemical testing of a single sample, composited from cores within the DMMU. In accordance with the LCRMA (Corps et al., 1998), the number of samples required of a proposed project will be determined on a case-by-case basis depending on: suspected contamination in surface and subsurface sediments, the heterogeneity of the sediment, the project rank, the areal extent of the DMMU, and the proposed depth of dredging. The proposed intensity of sampling for each Berth is presented in Table 1.
- **Core Section.** The length of each core section will vary depending on the sediment depth at each sample location. Each core sample will be taken at sediment high spots within each DMMU in order to test the maximum amount of sediment that is proposed for dredging. For each DMMU, individual cores will be composited into one sample per DMMU for laboratory analyses.

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4.2 Number of Samples Required

Berthing Areas. The number of subsurface core samples required to characterize each DMMU were selected in accordance with the LCRMA (Corps et al., 1998). The LCRMA presents a classification scheme for ranking DMMUs as high, moderate, low-moderate, and low. In that order, these ranks represent a best professional judgment of concern for potential risk, typically reflective of a scale of decreasing potential for adverse biological effects or decreasing concentration of chemicals of concern. Based on an evaluation of available data and discussions with Mr. Mark Siipola of the Portland District Corps (Port, Personal Communication 6/19/98), this project has been conservatively rated as moderate and the intensity of sediment sampling developed accordingly. Therefore, following LCRMA guidance, the maximum volume of sediment that can be represented by a single chemical analysis is 20,000 cubic yards. The proposed dredge prisms at each site will be divided into two separate DMMUs for characterization.

Grab Samples. The 12 grab samples form the Willamette River are designed to test the sediment quality from areas that were not tested during the Corps' 1997 sediment characterization study. One surface grab sample will be taken from each site. The coordinates of these locations are given in Table 2. In addition, grab samples will replace core samples for those DMMU's where scouring processes make deepening to the proposed dredge prism unnecessary (i.e., United Grain Terminal, Peavey Grain Terminal, and LDC Terminal).

4.3 Sampling and Compositing Scheme

The sampling and analysis program is developed with consideration of site-specific project and environmental factors. A key requirement is assuring that if an individual DMMU is found unsuitable for unconfined open water disposal, then that unit can be dredged independently from surrounding clean sediments so that the contaminated material can be disposed of at an alternate approved disposal site.

4.3.1 Sampling Scheme

Basic criteria for selecting sampling locations and compositing for analysis are contained in the recently developed Draft LCRMA guidance (Corps et al., 1998).

Sample Locations. The sampling locations in each DMMU will be taken within 3 meters (m) of the coordinates given in Table 1. At each Berth, two sediment

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cores will be collected parallel to the dock face, providing two cores for each DMMU except T6 which will have3 core locations due to the length of the berthing area and the potential amount of dredged material.

Core Sampling Depths. Sediment cores at each location will be collected from the sediment-water interface (approximately -40 ft CRD) down to an elevation of -45.0 feet CRD (i.e., to the design elevation of -43.0 feet plus two foot overdredge).

Compositing. At each Site, DMMU 1 will be comprised of sediments that represent the top 3 ft (e.g., -40 to -43 CRD). DMMU 2 will encompass the dredge material of the overdredge from -43 ft to -45 ft (2).

For the subsurface coring program, one sample from each DMMU will be submitted for chemical analysis. Each chemical sample will be comprised of a composite of two sediment cores from each DMMU. A sediment sample representing the sediments that will be uncovered during dredging will be archived and tested only if the chemical data from the bottom DMMU indicate a possibility that dredging to -45 ft CRD could uncover contaminated sediments.

Grab Sample Depths. Surface grab samples are designed to sample the top 10 centimeters (cm) of the sediment column.

4.3.2 Compositing Scheme

Sample compositing will be conducted for each proposed DMMU (see Table 1). The goal of sample compositing is to control analytical chemistry costs while maintaining the overall objective of obtaining an accurate representation and definition of the dredging area.

4.4 Field Sampling Schedule

The field sampling schedule is constrained by the shortest sample holding time (seven days). To safely meet the holding times for composited samples, the field samples will be composited and delivered for laboratory testing within three days of sampling. It is projected that the entire Portwide sampling program will be completed within five working days.

Initiation of sediment sampling will be preceded by preparation and cleaning of sample coring and handling equipment, acquisition of appropriate EPA-approved decontaminated sample containers from the analytical laboratory, and establishment of sampling locations along the river terminals.

4.5 Field Operations and Equipment

The field crew will be mobilized from Hart Crowser's Portland and Seattle Offices. The field crew will make sure all equipment is in good working order prior to initiating the sampling program. All field sampling and sediment handling will conform to the procedures outlined in the Health and Safety Plan presented in Appendix A.

4.5.1 Sediment Sampling Equipment

The sampling vessel and vibracore to be used for the sampling program will be provided by TEG Ocean Services of Santa Cruz, California. The vessel is a self powered 12x24 foot (ft) barge vessel, powered by a 25 horsepower outboard engine. The vessel is equipped with an A-frame, 2,000 lb. capacity winch, lines and blocks for handling all sampling equipment, washdown pump, digital echosounder, and a Differential Global Positioning System (DGPS) navigation system.

Subsurface sediment collection will be performed using a vibracore. The vibracore is a sediment collection instrument consisting of a 4-inch diameter aluminum core tube attached to a vibrating head that operates at approximately 10,000 cycles per minute, thus vibrating the core tube down into the sediment. Sediment is retained in the tube by a catcher, extracted from the harbor bottom, and the sample is brought on board the sampling vessel for processing.

Surface sediments will be collected using a Van Veen grab sampler capable of collecting a sediment sample that is representative of the top 10 cm of the sediment column.

The field representative will log each sample on a chain of custody form, noting the location, date, and time of collection. Subsequent chain of custody forms will be used to track the submittal of specific samples to the laboratory. A complete record of drilling and sampling operations will be maintained on the Sediment Sampling Form shown on Figure 3. Soil descriptions will be prepared using the system shown on the Key to Sediment Logs, which is presented on Figure 4.

4.5.2 Positioning

The objective of the positioning procedure is to accurately (±3m) determine and record the positions of all sampling locations. This determination will be achieved by referencing each sampling location to Latitude and Longitude coordinates with the use of known survey control points and DGPS.

The following parameters will be documented at each sampling location:

- Horizontal location in Latitude and Longitude, as appropriate;
- Vertical elevation in feet (including mudline and river elevation);
- Time and date; and
- River elevation referenced to Columbia River Datum.

These parameters will be measured using combinations of DGPS, river elevation gages, and back up methods (i.e., triangulation or taping to survey control points and/or terminal landmarks or structures).

Positioning while sampling will be performed using a DGPS which will provide positions every second with the potential for sub-meter accuracy for precise positioning of sample locations. The navigation system onboard the vessel will provide the vessel pilot with a navigation display to enable piloting to sample locations and recording of the exact location of the sediment core. As a back up, the visual horizontal triangulation method is proposed. Sampling locations will be identified by measuring the horizontal distance from the actual sampling location to a known survey control point and/or permanent structure to the nearest foot using an incremental tape measure. These horizontal measurements can be translated into state plane coordinates using project base maps.

4.5.3 Sample Collection Techniques

The collection of surficial and subsample sediments will follow the LCRMA guidance (Corps et al., 1998) and Puget Sound Estuary Program (PSEP, 1997) protocols. Sediment samples will be collected in the following manner:

- Vessel will maneuver to proposed sample locations and will anchor upstream of the proposed sample location.
- A decontaminated 10 foot aluminum core tube will be secured to the vibratory assembly and deployed from the vessel.

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- The cable to the vibracore will be drawn taut and perpendicular, as the core rests on the bottom sediment.
- Location of the vibracore and depth to sediment will be measured with a survey tape attached to the head assembly.
- A 4-inch, thin-walled, aluminum tube will be vibratory-driven into the sediment using the vibracore.
- A continuous core sample will be collected to the full length of the core tube or until refusal.
- The depth of core penetration will be measured and recorded.
- The vibracore will be turned off and the core barrel will be extracted from the sediment using the winch.
- While suspended from the A-frame, the assembly and core barrel will be sprayed off and then placed on the vessel deck.
- The core sample will be evaluated at the visible ends of the core tube to ensure that retrieved sediment core reached the required depth.

Sample recovery will be inspected relative to the following Hart Crowser acceptance criteria:

- Overlying water is present and the surface is intact;
- Calculated sediment compaction is not greater than 40 percent; and
- The core tube appears intact without obstruction or blocking.

Once the core samples are deemed acceptable, the cutter head will be removed and a cap will be placed over the end of the tube and secured firmly in place with duct tape. The core will then be removed from the sampler and the other end of the core will be capped and taped. A label identifying the core will be securely attached to the outside of the core and wrapped with transparent tape to prevent loss or damage of the label. The core sections will be stored on Blue Ice in coolers. The cores will be sealed tightly enough to prevent leakage or disturbance during transport.

As samples are collected, logs and field notes of all sediment samples will be maintained in a project notebook. Included in this log will be the following:

- Calculated elevation of each sediment sample as measured from the Columbia River Datum (CRD);
- Date and time of sampling;

- Initials of person supervising the sampling operation;
- Weather conditions;
- Sample location number and core section identification;
- Physical description of sediment; and
- Chronological occurrence of events during sampling operations.

4.6 Equipment Decontamination Procedures

Sampling and sediment compositing equipment will be thoroughly cleaned prior to use and after each sample collection event. Sampling equipment will be decontaminated according to the following procedure:

- Wash with brush and Alconox soap;
- Rinse with tap water; and
- Rinse with deionized water.

After cleaning, all sampling equipment will be wrapped in foil or plastic to limit the risk of contamination.

All hand work (e.g., using stainless steel spoons for extracting the sample from the split cores, mixing the samples and filling sample containers) will be conducted with disposable latex gloves which will be rinsed with distilled water before and after handling each individual sample, as appropriate, to prevent sample contamination. Gloves will be disposed of between composites to prevent cross contamination between the DMMUs.

4.7 Sample Compositing and Subsampling

4.7.1 Extrusion

Core sections will have their sealed caps removed for extrusion. The sediment from each sample tube will be extruded onto a plastic lined core sediment holder. The sample will be disturbed as little as possible when extruding. Upon extrusion, the core will be split with a decontaminated stainless steel wire core splitter.

A color photograph will be taken and the sediment description of each core sample will be recorded on the sediment sampling log for the following parameters as appropriate and present:

- Sample recovery;
- Physical soil description in accordance with the Unified Soil Classification System (includes soil type, density/consistency of soil, color);
- Odor (e.g., hydrogen sulfide, petroleum);
- Visual stratification, structure, and texture;
- Vegetation;
- Debris;
- Biological Activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms);
- Presence of oil sheen; and
- Any other distinguishing characteristics or features.

4.7.2 Sample Volume

Approximately three liters of homogenized sample will be prepared to provide adequate volume for physical and chemical laboratory analyses. Portions of each composite sample will be placed in appropriate containers obtained from the analytical chemistry laboratories. See Table 3 for container and sample size information.

Each sample container will be clearly labeled with the project name, sample/composite identification, type of analysis to be performed, date and time, initials of person(s) preparing the sample, and referenced by entry into the log book. Samples will be stored at approximately 4°C until withdrawn for analysis.

4.8 Sample Transport and Chain of Custody Procedures

Containerized sediment samples will be transported to Columbia Analytical Services (CAS) after compositing is completed. Specific sample shipping procedures will be as follows:

- Each cooler or container containing the sediment samples for analysis will be delivered to the laboratory within 24 hours of being sealed.
- Individual sample containers will be packed to prevent breakage and transported in a sealed ice chest or other suitable container.
- The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container and consultant's office name and address) to enable positive identification.
- Glass jars will be separated in the shipping container by shock absorbent material (e.g., bubble wrap) to prevent breakage.
- Ice will be placed in separate plastic bags and sealed.
- A sealed envelope containing custody forms will be enclosed in a plastic bag and taped to the inside lid of the cooler.
- Signed and dated custody seals will be placed on all coolers prior to shipping.

Upon transfer of sample possession to the analytical laboratory, the custody form will be signed by the persons transferring custody of the sample container. Upon receipt of samples at the laboratory, the shipping container seal will be broken and the condition of the samples will be recorded by the receiver. Custody forms will be used internally in the lab to track'sample handling and final disposition.

5.0 LABORATORY PHYSICAL AND CHEMICAL SEDIMENT ANALYSIS

5.1 Chemical Analyses Protocols

Laboratory testing procedures will be conducted in accordance with LCRMA guidance (Corps et al., 1998). Several details of these procedures are discussed below.

5.1.1 Chain of Custody

A chain of custody record for each set of samples will be maintained throughout all sampling activities and will accompany samples and shipment to the laboratory. Information tracked by the chain of custody records in the laboratory include sample identification number, date and time of sample receipt, analytical parameters required, location and conditions of storage, date and time of removal from and return to storage, signature of person removing and returning the sample, reason for removing from storage, and final disposition of the sample.

5.1.2 Limits of Detection

The sediment composite samples identified in Table 1 will be analyzed for each of the parameters listed in Table 4. The analytical test methods and method detection limits to be achieved by the analytical laboratory are also identified in Table 4. The testing laboratory (CAS) is aware of the LCRMA detection limit requirements and will employ all reasonable means, including additional cleanup steps and method modifications, to bring detection limits below these screening levels. In addition, an aliquot (8 oz) of each composited sediment sample will be archived (frozen) at -20°C for additional analysis if necessary.

In all cases, to avoid potential problems and leave open the option for retesting, sediments or extracts will be kept under proper storage conditions until the chemistry data are deemed acceptable by the Corps and DEQ.

5.1.3 Holding Times

All samples for physical and chemical testing will be maintained at the testing laboratory in accordance with the sample holding limitations and storage temperature requirements listed in Table 3.

5.1.4 Quality Assurance/Quality Control

The chemistry QA/QC requirements found in Table 5 will be met.

5.2 Laboratory Written Report

A written report will be prepared by the analytical laboratory documenting the activities associated with sample analyses. As a minimum, the following will be included in the report:

- Results of the laboratory analyses and QA/QC results;
- Protocols used during analyses;
- Chain of custody procedures, including explanation of any deviation from those identified herein;

- Any protocol deviations from the approved sampling plan; and
- Location and availability of data.

As appropriate, this sampling plan may be referenced in describing protocols.

6.0 REPORTING

6.1 QA Report

The project quality assurance representative will prepare a quality assurance report based upon activities involved with the field sampling and review of the laboratory analytical data. The laboratory QA/QC reports will be incorporated by reference. This report will identify any field and laboratory activities that deviated from the approved sampling plan and the referenced protocols and will make a statement regarding the overall validity of the data collected. The QA/QC report will be incorporated into the Final Report.

6.2 Final Report

Hart Crowser will prepare a written report documenting all activities associated with collection, compositing, transportation, and analysis of samples. The chemical testing reports from the analytical laboratory will be included as appendices. At a minimum, the following will be included in the final report:

- Type of sampling equipment used;
- Protocols and procedures used during sampling and testing and an explanation of any deviations from the sampling plan protocols;
- Descriptions and core logs of each sample, including penetration and recovery depths, compositing intervals, mudline elevation, grain size, and geologic contacts;
- Methods used to locate the sampling positions within an accuracy of ±3m;
- Maps and tables identifying locations where the sediment samples were collected and reported in latitude and longitude to the nearest tenth of a second on State Plane Coordinates;
- A plan view of the project site showing the terminal, bathymetry, and actual sampling locations;

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- Chain of custody procedures used, and explanation of any deviations from the sampling plan procedures;
- Tabular summary of chemical testing results, with comparisons to LCRMA screening levels; and
- Final QA report as discussed above.

7.0 PROJECT SCHEDULE

The project schedule is designed to begin sampling as soon as possible in order to complete the project by the end of 1998. A general project schedule is presented below.

Tentative Schedule

Activity	Start Date	End Date
Field Sampling	September 14	September 20
Chemical Analyses	September 21	October 2
Draft Report	October 2	November 2

HART CROWSER, INC.

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OREGON
OCT. 2, 1990
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EXPIRES: DEC. 31, 1999

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8.0 REFERENCES

Corps et al., 1998. Dredged Material Evaluation Framework, Lower Columbia River Management Area. Draft April 1998.

Ogden Beeman & Associates, Inc. and Hartman Associates, Inc., 1996. Port of Portland, Dredged Material Management Study. October 1996.

Puget Sound Estuary Program (PSEP), 1997. Recommended Guidelines for Sampling Marine Sediment, Water Column, and Tissue in Puget Sound. Prepared for EPA, Region 10 and Puget Sound Water Quality action Team. April 1997.

Tables

Table 1 - Proposed Sediment Sampling Locations--Berthing Areas

Subsurface Core Location	Easting Coordinate	Northing Coordinate	Approximate Bathymetry in Feet (CRD)	Core Sample Bottom Elevation in Feet (CRD)	Core Depth in Feet	DMMU Identification	Sample Identification
Port of Portland - Terminal 6							
HC-VC-01	TBD	TBD	-40	-43	3	T6/1	HC-T6-Top
HC-VC-02	TBD	TBD	-43	-45	2	T6/2	HC-T6-Bottom
Port of Portland - Berth 501							
HC-VC-03	TBD	TBD	-40	-43	3	B501/1	HC-B501-Top
HC-VC-04	TBD	TBD	-43	-45	2	B501/2	HC-B501-Bottom
Port of Portland - Berth 401							
HC-VC-05	TBD	TBD	-40	-43	3	B401/1	HC-401-Top
HC-VC-06	TBD	TBD	-43	-45	2	B401/2	HC-401-Bottom
Port of Portland - Irving Street							
HC-VC-07	TBD	TBD	-40	-43	3	IS/1	HC-IS-Top
HC-VC-08	TBD	TBD	-43	-45	2	IS/2	HC-IS-Bottom
Port of Portland - Louis Dreyfus							
HC-VC-09	TBD	TBD	-40	-43	3	LD/1	HC-LDC-Top
HC-VC-10	TBD	TBD	-43	-45	2	LD/2	HC-LDC-Bottom
Port of Kalama - Harvest States							
HC-VC-11	TBD	TBD	-40	-43	3	HS/1	HC-HS-Top
HC-VC-12	TBD	TBD	-43	-45	2	HS/2	HC-HS-Bottom
Port of Kalama - Peavey Grain							
HC-VC-13	TBD	TBD	-40	-43	3	PG/1	HC-PG-Top
HC-VC-14	TBD	TBD	-43	-45	2	PG/2	HC-PG-Bottom
Port of Vancouver - United Grain							
HC-VC-15	TBD	TBD	-40	-43	3	UG/1	HC-UG-Top
HC-VC-16	TBD	TBD	-43	-45	2	UG/2	HC-UG-Bottom
Port of Longview - Longview Grain							
HC-VC-17	TBD	TBD	-40	-43	3	LG/1	HC-LG-Top
HC-VC-18	TBD	TBD	-43	-45	2	LG/2	HC-LG-Bottom

TBD - Location to be determined in field

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Table 2 - Proposed Surface Sediment Sampling Locations--Willamette River

Sampling Point	Longitude	Latitude
1	122°46'48.3"	45°36'18.9"
2	122°46'38.5"	45°35'58.9"
3	122°46'22.4"	45°35'40.2"
4	122°45'35.3"	45°34'55.6"
5	122°45'30.8"	45°34'57.6"
6	122°45'19.7"	45°34'53.2"
7	122°44'15.5"	45°34'23.4"
8	122°43'49.0"	45°34'05.7"
9	122°42'12.0"	45°33'13.6"
10	122°41'54.7"	45°33'06.3"
11	122°41'24.5"	45°32'38.5"
12	122°41'01.0"	45°32'21.4"

Locations expressed to tenth of a second.

Table 3 - Sample Storage Criteria

Sample Type	Holding Time	Sample Size[a]	Temperature[b]	Container
Particle Size	6 Months	100-200g (150 ml)	4°C	1-liter Glass (combined)
Total Solids	14 Days	125g (100 ml)	4°C	
Total Volatile Solids	14 Days	125 g (100 ml)	4°C	
Total Organic Carbon	14 Days	125 g (100 ml)	4°C	
Ammonia	7 Days	25 g (20 ml)	4°C	
Metals (except Mercury)	6 Months	50 g (40 ml)	4°C	
Semivolatiles, Pesticides and PCBs	14 Days until extraction 1 Year until extraction 40 Days after extraction	150 g (120 ml)	4°C 4°C 4°C	
Tributyltin	14 Days until extraction	50 g (40 ml)		
Mercury	28 Days	5 g (4 ml)	4°C	
Total Sulfides	7 Days	50g (40 ml)	4°C[c]	125 ml Plastic
Biological Testing	8 weeks	4 liters	4°C[c]	4-1 liter Glass
Archive	1 year	--	-20°C	250 ml Glass

a. Recommended minimum field sample sizes for one laboratory analysis. Actual volumes to be collected have been increased to provide a margin of error and allow for retests.
b. During transport to the lab, samples will be stored on blue ice. The mercury and archived samples will be frozen immediately upon receipt at the lab.
c. The sulfides sample will be preserved with 5 ml of 2 Normal zinc acetate per 30 g of sediment.

Table 4 - Analyte List and Targeted Detection Limits

Analytes	Analytical Method	Reporting Limit[a]	LCRMA-SL
CHEMICAL PARAMETERS SEDIMENTS			
Metals in mg/kg (ppm)			
Antimony	U.S. EPA Method 6020	0.5	150
Arsenic	U.S. EPA Method 6020	0.5	57
Cadmium	U.S. EPA Method 6010A	0.5	5.1
Copper	U.S. EPA Method 6010A	0.5	390
Lead	U.S. EPA Method 6010A	0.5	450
Mercury	U.S. EPA Method 7471A	0.05	0.41
Nickel	U.S. EPA Method 6010A	0.5	140
Silver	U.S. EPA Method 6010A	0.5	6.1
Zinc	U.S. EPA Method 6010A	0.5	410
Tributyltin (as tin) in ug/L (ppb)	GC/FPD	0.025	0.15
Phenol in ug/kg (ppb)	GC/MS-SIM		
Phenol	GC/MS-SIM	13	420
2-Methylphenol	GC/MS-SIM	13	63
4-Methylphenol	GC/MS-SIM	13	670
2,4-Dimethylphenol	GC/MS-SIM	13	29
Pentachlorophenol	GC/MS-SIM	13	400
LPAHs in ug/kg (ppb)			
Naphthalene	GC/MS-SIM	6.7	2,100
2-Methylnaphthalene	GC/MS-SIM	6.7	670
Acenaphthylene	GC/MS-SIM	6.7	560
Acenaphthene	GC/MS-SIM	6.7	500
Fluorene	GC/MS-SIM	6.7	540
Phenanthrene	GC/MS-SIM	6.7	1,500
Anthracene	GC/MS-SIM	6.7	960
HPAHs in ug/kg (ppb)			
Fluoranthene	GC/MS-SIM	6.7	1,700
Pyrene	GC/MS-SIM	6.7	2,600
Benz(a)anthracene	GC/MS-SIM	6.7	1,300
Chrysene	GC/MS-SIM	6.7	1,400
Total benzofluoranthenes	GC/MS-SIM	13	3,200
Benzo(a)pyrene	GC/MS-SIM	6.7	1,600
Indeno(1,2,3-cd)pyrene	GC/MS-SIM	6.7	600
Dibenz(a,h)anthracene	GC/MS-SIM	6.7	230
Benzo(g,h,i)perylene	GC/MS-SIM	6.7	670
Chlorinated Hydrocarbons in ug/kg			
1,3-Dichlorobenzene	GC/MS-SIM	13	170
1,4-Dichlorobenzene	GC/MS-SIM	13	110
1,2-Dichlorobenzene	GC/MS-SIM	13	35
1,2,4-Trichlorobenzene	GC/MS-SIM	13	31
Hexachlorobenzene	GC/MS-SIM	13	22
Phthalates in ug/kg (ppb)			
Dimethyl phthalate	GC/MS-SIM	35	1,400
Diethyl phthalate	GC/MS-SIM	35	1,200
Di-n-butyl phthalate	GC/MS-SIM	35	5,100

Table 4 - Analyte List and Targeted Detection Limits

Analytes	Analytical Method	Reporting Limit[a]	LCRMA-SL
CHEMICAL PARAMETERS SEDIMENTS			
Butyl benzyl phthalate	GC/MS-SIM	35	970
Bis(2-ethylhexyl)phthalate	GC/MS-SIM	35	8,300
Di-n-octyl phthalate	GC/MS-SIM	35	6,200
Misc. Extractables in ug/kg			
Benzyl alcohol	GC/MS-SIM	50	57
Benzoic acid	GC/MS-SIM	50	650
Dibenzofuran	GC/MS-SIM	6.7	540
Hexachloroethane	GC/MS-SIM	13	1,400
Hexachlorobutadiene	GC/MS-SIM	13	29
N-Nitrosodiphenylamine	GC/MS-SIM	13	28
Pesticides/PCBs in ug/kg (ppb)			
Total PCBs	U.S. EPA Method 8080A	50	130
4,4'-DDE	U.S. EPA Method 8080A	5	NA
4,4'-DDD	U.S. EPA Method 8080A	5	NA
4,4'-DDT	U.S. EPA Method 8080A	5	6.9
Chlordane (alpha, gamma)	U.S. EPA Method 8080A	5	10
Aldrin	U.S. EPA Method 8080A	5	10
Dieldrin	U.S. EPA Method 8080A	5	10
Heptachlor	U.S. EPA Method 8080A	5	10
Lindane	U.S. EPA Method 8080A	5	10
CONVENTIONAL PARAMETERS			
Grain size	PSEP		
Percent solids	PSEP		
Total volatile solids	PSEP/EPA 160.4M	10 ppm	
Total organic carbon	PSEP/ASTM D4129-82M	50 ppm	
Total sulfides	PSEP	10-50 ppm	
Ammonia	U.S. EPA Method 350.1	1.0 ppm	
CHEMICAL PARAMETERS WATER			
Total Suspended Solids in mg/L	EPA Method 160.2		
Dissolved Metals in ug/L			
Arsenic	EPA Method 200.8	0.5	
Cadmium	EPA Method 200.8	0.02	
Chromium	EPA Method 200.8	0.2	
Copper	EPA Method 200.8	0.1	
Lead	EPA Method 200.8	0.02	
Mercury	EPA Method 6010	0.1	
Nickel	EPA Method 200.8	0.2	
Selenium	EPA Method 200.8	1	
Silver	EPA Method 200.8	0.02	
Thallium	EPA Method 200.8	0.02	
Zinc	EPA Method 200.8	0.5	

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Table 4 - Analyte List and Targeted Detection Limits

Analytes	Analytical Method	Reporting Limit[a]	LCRMA-SL
CHEMICAL PARAMETERS WATER			
PAHs in ug/L			
Naphthalene	EPA Method 8270	10	
Acenaphthylene	EPA Method 8270	10	
Acenaphthene	EPA Method 8270	10	
Fluorene	EPA Method 8270	10	
Phenanthrene	EPA Method 8270	10	
Anthracene	EPA Method 8270	10	
2-Methylnaphthalene	EPA Method 8270	10	
Fluoranthene	EPA Method 8270	10	
Pyrene	EPA Method 8270	10	
Benzo(a)anthracene	EPA Method 8270	10	
Chrysene	EPA Method 8270	10	
Benzo(b)fluoranthene	EPA Method 8270	10	
Benzo(k)fluoranthene	EPA Method 8270	10	
Benzo(a)pyrene	EPA Method 8270	10	
Indeno(1,2,3-cd)pyrene	EPA Method 8270	10	
Dibenz(a,h)anthracene	EPA Method 8270	10	
Benzo (g,h,i) Perylene	EPA Method 8270	10	
Phthalates in ug/L			
Dimethylphthalate	EPA Method 8270	10	
Diethyphthalate	EPA Method 8270	6	
Bis(2-ethylhexyl)phthalate	EPA Method 8270	10	
di-n-butyl phthalate	EPA Method 8270	10	
di-n-octyl phthalate	EPA Method 8270	10	
butylbenzylphthalate	EPA Method 8270	10	
Phenols in ug/L			
Phenol	EPA Method 8270	10	
2-Chlorophenol	EPA Method 8270	10	
2-Methyphenol	EPA Method 8270	10	
4-Methyphenol	EPA Method 8270	10	
2-Nitrophenol	EPA Method 8270	10	
2,4-Dimethylphenol	EPA Method 8270	10	
2,4-Dichlorophenol	EPA Method 8270	10	
4-chloro-3-methylphenol	EPA Method 8270	10	
2,4,6-Trichlorophenol	EPA Method 8270	10	
2,4,5-Trichlorophenol	EPA Method 8270	10	
2,4-Dinitrophenol	EPA Method 8270	10	
4-Nitrophenol	EPA Method 8270	10	
4,6-Dintro-2-methyphenol	EPA Method 8270	10	
Pentachlorophenol	EPA Method 8270	3*	
Semivolatile Organics in ug/L			
n-Nitrosodimethylamine	EPA Method 8270	10	
n-Nitroso-di-n-propylamine	EPA Method 8270	10	
n-Nitrosodiphenylamine	EPA Method 8270	10	
2-Nitroaniline	EPA Method 8270	10	

Table 4 - Analyte List and Targeted Detection Limits

Analytes	Analytical Method	Reporting Limit[a]	LCRMA-SL
CHEMICAL PARAMETERS WATER			
3-Nitroaniline	EPA Method 8270	10	
4-bromophenyl-phenylether	EPA Method 8270	10	
4-chloroaniline	EPA Method 8270	10	
4-Chlorophenyl-phenylether	EPA Method 8270	10	
4-Nitroaniline	EPA Method 8270	10	
1,2-Dichlorobenzene	EPA Method 8270	10	
1,3-Dichlorobenzene	EPA Method 8270	10	
1,4-Dichlorobenzene	EPA Method 8270	10	
2,4-Nitrotoluene	EPA Method 8270	10	
2,6-Nitrotoluene	EPA Method 8270	10	
3,3-Dichlorobenzidine		10	
1,2,4-Trichlorobenzene	EPA Method 8270	10	
Aniline	EPA Method 8270	10	
Benzidine	EPA Method 8270	10	
Benzoic Acid	EPA Method 8270	10	
Benzyl alcohol	EPA Method 8270	10	
bis(2-chloroethyl)ether	EPA Method 8270	10	
bis(2-chloroisopropyl)ether	EPA Method 8270	10	
bis(2-chloroethoxy)methane	EPA Method 8270	10	
Dibenzofuran	EPA Method 8270	10	
Hexachloroethane	EPA Method 8270	10	
Hexachlorobenzene	EPA Method 8270	0.3*	
Hexachlorobutadiene	EPA Method 8270	10	
Hexachlorocyclopentadiene	EPA Method 8270	10	
Isophorone	EPA Method 8270	10	
Nitrobenzene	EPA Method 8270	10	
Pesticides/PCBs in ug/L			
Aldrin	EPA Method 8081	0.04	
alpha-BHC	EPA Method 8081	0.04	
beta-BHC	EPA Method 8081	0.04	
gamma-BHC	EPA Method 8081	0.04	
delta-BHC	EPA Method 8081	0.04	
Chlordane	EPA Method 8081	0.09	
4,4'-DDD	EPA Method 8081	0.04	
4,4'-DDE	EPA Method 8081	0.04	
4,4'-DDT	EPA Method 8081	0.007*	
Dieldrin	EPA Method 8081	0.006*	
Endosulfan I	EPA Method 8081	0.02*	
Endosulfan II	EPA Method 8081	0.03*	
Endosulfan Sulfate	EPA Method 8081	0.04	
Endrin	EPA Method 8081	0.003*	
Endrin Aldehyde	EPA Method 8081	0.04	
Endrin Ketone	EPA Method 8081	0.04	
Heptachlor	EPA Method 8081	0.004*	
Heptachlor Epoxide	EPA Method 8081	0.04	

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Table 4 - Analyte List and Targeted Detection Limits

Analytes	Analytical Method	Reporting Limit[a]	LCRMA-SL
CHEMICAL PARAMETERS WATER			
Methoxychlor	EPA Method 8081	0.1	
Toxaphene	EPA Method 8081	0.2	
PCB 1016	EPA Method 8081	0.03*	
PCB 1221	EPA Method 8081	0.06*	
PCB 1232	EPA Method 8081	0.08*	
PCB 1242	EPA Method 8081	0.03*	
PCB 1248	EPA Method 8081	0.04*	
PCB 1252	EPA Method 8081	0.04*	
PCB 1260	EPA Method 8081	0.03*	

[a] Reporting Limit based on dry weight and assuming solids content greater than 50 percent. The reporting limits shown are adequate for comparison with LCRM criteria.

* Value is the MDL.

Table 5 - Minimum Laboratory QA/QC

Analysis Type	Method Blanks	Triplicates[5]	Replicates	Matrix Spike[5]	Surrogates[1]
Ammonia/Sulfides	X[5]	X			
Semivolatiles[2,3]	X[4]		X[6,7]	X	X
Pesticides/PCBs[2,3]	X[4]		X[6,7]	X	X
Metals	X[5]		X[5]	X	
Total Organic Carbon	X[5]	X			
Total Solids		X			
Total Volatile Solids		X			
Particle Size		X			

1 Surrogate spikes required for every sample, including matrix spiked samples, blanks and reference materials.
2 Initial calibration required before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet criteria.
3 Ongoing calibration required at the beginning of each work shift, every 10-12 samples or every 12 hours (whichever is more frequent), and at the end of each shift.
4 Frequency of Analysis (FOA) = one per extraction batch
5 FOA = 5% or one per batch, whichever is more frequent
6 FOA = <20 samples: one per batch; 20+ samples: 1 triplicate and additional duplicates for a minimum of 5% total replication
7 Matrix spike duplicate will be run

Figures

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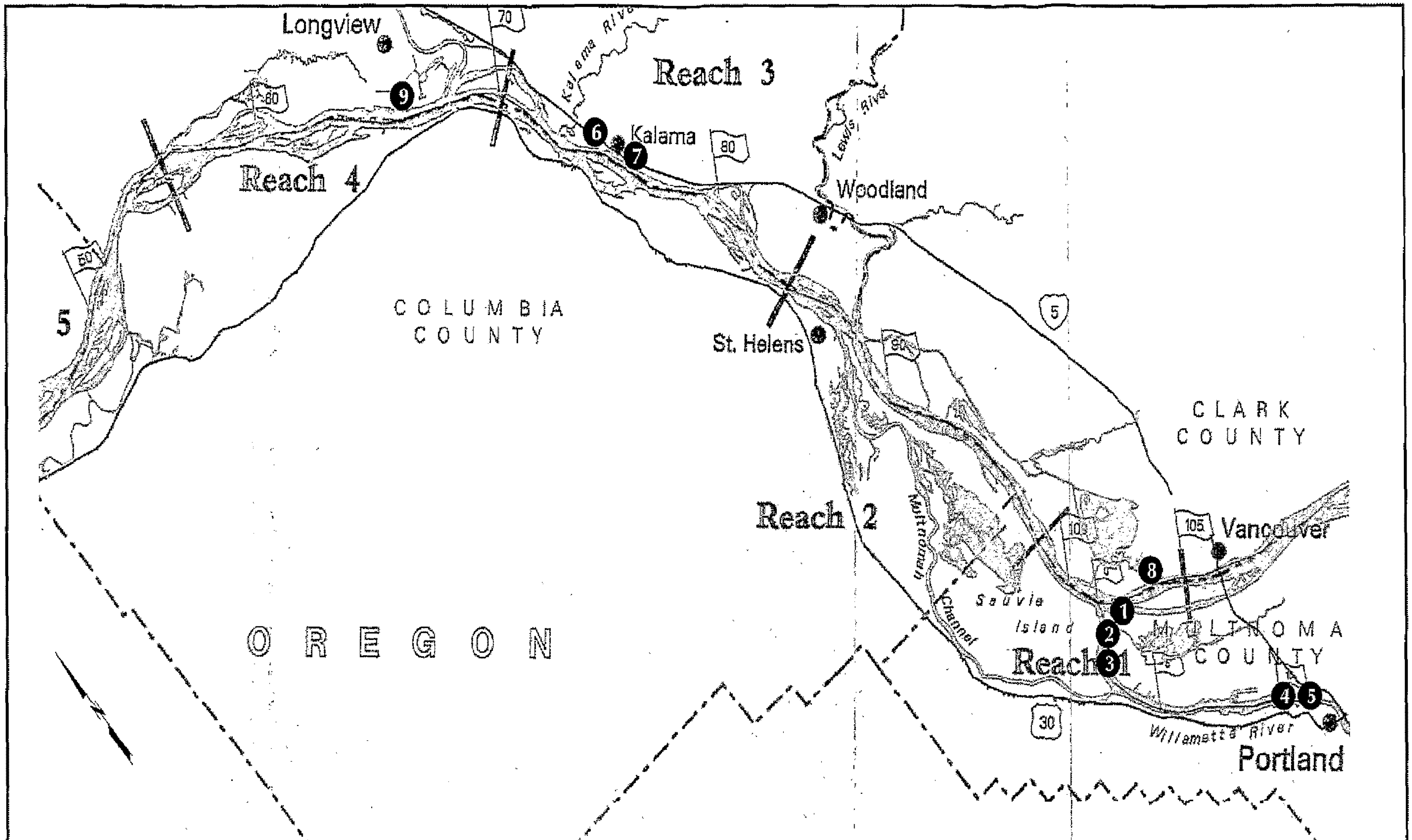
General Location of Sampling Areas

Portwide Sampling Project



Note: Base map prepared from "Columbia River Dredged material Management Study Overview Map".

Proposed FC Study Sites:

	Site	Port Facility	River
1	Terminal 6	Port of Portland	Columbia
2	Berth 501		Willamette
3	Berth 401		Willamette
4	Irving Street Terminal		Willamette
5	Louis Dreyfus Terminal (LDC)		Willamette
6	Peavey Grain Terminal	Port of Kalama	Columbia
7	Harvest States Grain Terminal		Columbia
8	United Grain Terminal	Port of Vancouver	Columbia
9	Longview Grain Wharf	Port of Longview	Columbia

4 0 4 8

SCALE IN MILES

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Figure 1

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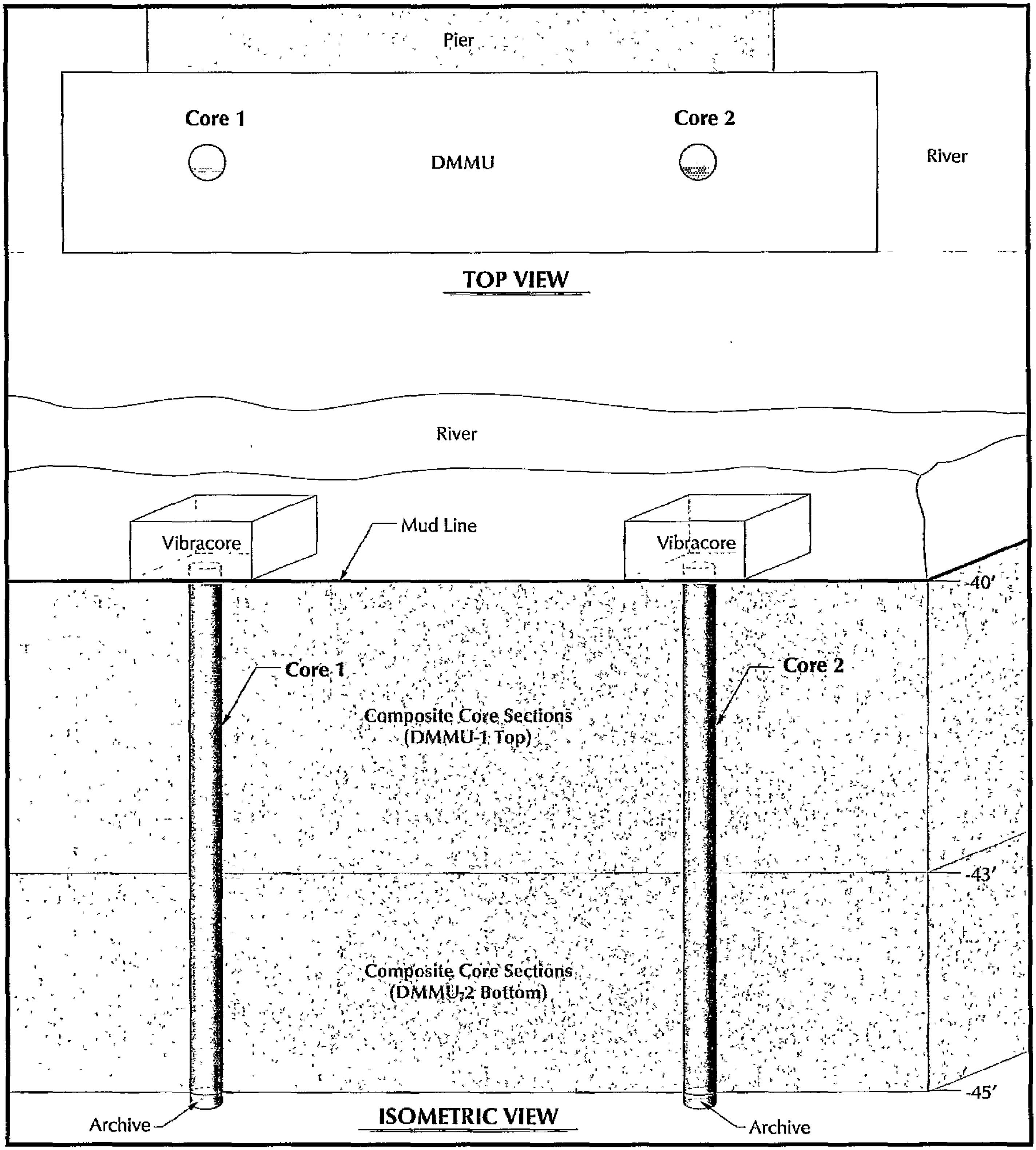
Vibracore Sampling Depths

Portwide Sampling Project



Not to Scale

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Figure 2

Sediment Sampling Form
Portwide Sampling Project

Project ______________________ Date ______________________

Job No. ______________________ HC Reps ______________________

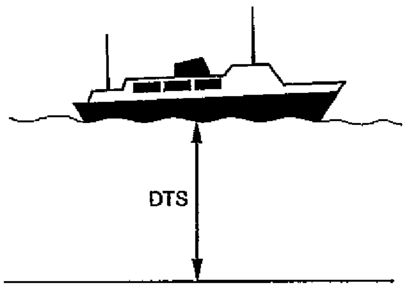
Subcontractor ______________________ Conditions ______________________

Sample Location ______________________

Sample Method ______________________

Proposed Coordinates N: ______________________

E: ______________________



Elevation of Water ______________________

Tide ______________________

Elevation of Sediment ______________________

SAMPLE ACCEPTABILITY CRITERIA:
1. Overlying water is present
2. Water has low turbidity
3. Sampler is not overfilled
4. Surface is flat
5. Desired penetration depth

Run #	Time	Northing	Easting	Sampling Accepted Y/N	Comments (ie: penetration depth, biota, disturbance)

Sediment Description ______________________

Sample Container Type ______________________

Volume Filled ______________________

Analysis ______________________

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Figure 3

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Key to Sediment Logs
Portwide Sampling Project

Sample Description
Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency
Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.
Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 - 4	Very soft	0 - 2	<0.125
Loose	4 - 10	Soft	2 - 4	0.125 - 0.25
Medium dense	10 - 30	Medium stiff	4 - 8	0.25 - 0.5
Dense	30 - 50	Stiff	8 - 15	0.5 - 1.0
Very dense	>50	Very stiff	15 - 30	1.0 - 2.0
		Hard	>30	>2.0

Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

Minor Constituents

	Estimated Percentage
Not identified in description	0 - 5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Legends

Surface Sample Acceptability Criteria:
1. Overlying water is present
2. Water has low turbidity
3. Sampler is not overfilled
4. Surface is flat
5. Penetration depth is acceptable

Estimated Percentage of other Minor Constituents
(ie. shells, wood, organics, plastic, metal brick, refuse)

	Estimated Percentage
Dusting	Trace on Surface
Trace	0-5
Moderate	5-20
Substantial	20-50

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Figure 4

T4T900002572

Appendix A

APPENDIX A
HEALTH AND SAFETY PLAN

Table A-3 - Record of Health and Safety Communication*

PROJECT NAME:			
SITE CONTAMINANTS:			
PPE REQUIREMENTS (check all that apply): X Safety glasses X Safety boots X Hard hat	X Gloves (specify) X Clothing (specify) __PVC Rainsuit __Respirator __Other (specify)	Neoprene Outer/Nitrile or Latex Inner	
The following personnel have reviewed a copy of the Site-specific Health and Safety Plan. By signing below, these personnel indicate that they have read the plan, including all referenced information, and that they understand the requirements which are detailed for this project.			
PRINTED NAME	SIGNATURE	PROJECT DUTIES	DATE

*PROJECT MANAGER: PLEASE ROUTE A COPY OF THIS FORM TO THE CORPORATE H&S MANAGER WHEN COMPLETED.

APPENDIX A
HEALTH AND SAFETY PLAN
PORTWIDE SAMPLING PROJECT
DATE PREPARED: SEPTEMBER 3, 1998

EMERGENCY CONTINGENCY INFORMATION

SITE LOCATION	Port of Portland Marine Terminal 6 on Columbia River and Berth 501, Berth 401, Irving Street Terminal, and Louis Dreyfus Terminal (LDC) on Willamette River Portland, Oregon
NEAREST HOSPITALS	Bess Kaiser Medical Center; Emergency Department 5055 N Greeley (503)285-9321 The routes to the hospital are depicted on Figure A-1.
EMERGENCY RESPONDERS	Police Department.. 911 Fire Department.. 911 Ambulance.. 911
EMERGENCY CONTACTS	Hart Crowser, Portland Office...........(503)620-7284 Sebastian Degens, Port of Portland Facility Contact..............................(503)731-7214 Marine Security..............................(503)240-2230
IN EVENT OF EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE	Give the following information: ╠ **Where You Are.** Address, cross streets, or landmarks (**Phone Number** you are calling from ?? **What Happened.** Type of injury, accident # **How many persons** need help ?? **What is being done** for the victim(s) !! **You hang up last.** Let whomever you called hang up first

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SITE HEALTH AND SAFETY PLAN SUMMARY

SITE NAME: Terminal 6, Berth 501, Berth 401, Irving Street Terminal, and Louis Dreyfus Terminal (LDC)

LOCATION: See Figure A-1

CLIENT: Port of Portland

PROPOSED DATES OF ACTIVITIES: Approximately October 1 through October 30, 1998

TYPE OF FACILITY: River Terminal

LAND USE OF AREA SURROUNDING FACILITY: Industrial

SITE ACTIVITIES: Collection of Sediment Cores

POTENTIAL SITE CONTAMINANTS: PAHs, Metals

ROUTES OF ENTRY: Airborne dust; skin contact with sediments and incidental ingestion of soil.

PROTECTIVE MEASURES: Engineering controls, safety glasses, safety boots, hard hat, gloves, protective clothing, and respirators.

MONITORING EQUIPMENT: None

HEALTH AND SAFETY PLAN
PORTWIDE SAMPLING PROJECT
DATE PREPARED: SEPTEMBER 3, 1998

EMERGENCY CONTINGENCY INFORMATION

SITE LOCATION	Port of Vancouver United Grain Terminal on Columbia River Vancouver, Washington
NEAREST HOSPITALS	Southwest Washington Medical Center 400 NE Mother Joseph Place (360) 256-2000 The routes to the hospital are depicted on Figure A-2.
EMERGENCY RESPONDERS	Police Department.. 911 Fire Department... 911 Ambulance.. 911
EMERGENCY CONTACTS	Hart Crowser, Portland Office...........(503)620-7284 Beth Reynosa, Port of Vancouver Facility Contact....................................(360)992-1105
IN EVENT OF EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE	Give the following information: ╠ **Where You Are.** Address, cross streets, or landmarks (**Phone Number** you are calling from ?? **What Happened.** Type of injury, accident # **How many persons** need help ?? **What is being done** for the victim(s) !! **You hang up last.** Let whomever you called hang up first

T4T900002578

SITE HEALTH AND SAFETY PLAN SUMMARY

SITE NAME: United Grain Terminal

LOCATION: See Figure A-2

CLIENT: Port of Portland

PROPOSED DATES OF ACTIVITIES: Approximately October 1 through October 30, 1998

TYPE OF FACILITY: River Terminal

LAND USE OF AREA SURROUNDING FACILITY: Industrial

SITE ACTIVITIES: Collection of Sediment Cores

POTENTIAL SITE CONTAMINANTS: PAHs, Metals

ROUTES OF ENTRY: Airborne dust; skin contact with sediments and incidental ingestion of soil.

PROTECTIVE MEASURES: Engineering controls, safety glasses, safety boots, hard hat, gloves, protective clothing, and respirators.

MONITORING EQUIPMENT: None

EMERGENCY CONTINGENCY INFORMATION

SITE LOCATION	Port of Kalama Peavey Grain Terminal and Harvest States Grain Terminal on Columbia River Kalama, Washington
NEAREST HOSPITALS	St. Johns Medical Center 1614 E. Kessler Blvd. Longview, Washington (360) 423-1530 The routes to the hospital are depicted on Figure A-3.
EMERGENCY RESPONDERS	Police Department...911 Fire Department...911 Ambulance...911
EMERGENCY CONTACTS	Hart Crowser, Portland Office...........(503)620-7284 Mark Wilson, Port of Kalama Facility Contact....................................(360)673-2336
IN EVENT OF EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE	Give the following information: ╠ **Where You Are.** Address, cross streets, or landmarks (**Phone Number** you are calling from ?? **What Happened.** Type of injury, accident # **How many persons** need help ?? **What is being done** for the victim(s) !! **You hang up last.** Let whomever you called hang up first

SITE HEALTH AND SAFETY PLAN SUMMARY

SITE NAME: Peavey Grain Terminal and Harvest States Grain Terminal

LOCATION: See Figure A-3

CLIENT: Port of Portland

PROPOSED DATES OF ACTIVITIES: Approximately October 1 through October 30, 1998

TYPE OF FACILITY: River Terminal

LAND USE OF AREA SURROUNDING FACILITY: Industrial

SITE ACTIVITIES: Collection of Sediment Cores

POTENTIAL SITE CONTAMINANTS: PAHs, Metals

ROUTES OF ENTRY: Airborne dust; skin contact with sediments and incidental ingestion of soil.

PROTECTIVE MEASURES: Engineering controls, safety glasses, safety boots, hard hat, gloves, protective clothing, and respirators.

MONITORING EQUIPMENT: None

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HEALTH AND SAFETY PLAN
PORTWIDE SAMPLING PROJECT
DATE PREPARED: SEPTEMBER 3, 1998

EMERGENCY CONTINGENCY INFORMATION

SITE LOCATION	Port of Longview Longview Grain Wharf on Columbia River Longview, Washington
NEAREST HOSPITALS	St. Johns Medical Center 1614 E. Kessler Blvd. Longview, Washington (360) 423-1530 The routes to the hospital are depicted on Figure A-4.
EMERGENCY RESPONDERS	Police Department........................ 911 Fire Department........................ 911 Ambulance........................ 911
EMERGENCY CONTACTS	Hart Crowser, Portland Office..........(503)620-7284 George Cress, Port of Longview Facility Contact..........................(360)425-3305
IN EVENT OF EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE	Give the following information: ╠ **Where You Are.** Address, cross streets, or landmarks (**Phone Number** you are calling from ?? **What Happened.** Type of injury, accident # **How many persons** need help ?? **What is being done** for the victim(s) !! **You hang up last.** Let whomever you called hang up first.

SITE HEALTH AND SAFETY PLAN SUMMARY

SITE NAME: Longview Grain Wharf

LOCATION: See Figure A-4

CLIENT: Port of Portland

PROPOSED DATES OF ACTIVITIES: Approximately October 1 through October 30, 1998

TYPE OF FACILITY: River Terminal

LAND USE OF AREA SURROUNDING FACILITY: Industrial

SITE ACTIVITIES: Collection of Sediment Cores

POTENTIAL SITE CONTAMINANTS: PAHs, Metals

ROUTES OF ENTRY: Airborne dust; skin contact with sediments and incidental ingestion of soil.

PROTECTIVE MEASURES: Engineering controls, safety glasses, safety boots, hard hat, gloves, protective clothing, and respirators.

MONITORING EQUIPMENT: None

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1.0 INTRODUCTION

1.1 Purpose and Regulatory Compliance

This site-specific Health and Safety Plan (H&S Plan) addresses procedures to minimize the risk of chemical exposures, physical accidents to on-site workers, and environmental contamination. The H&S Plan covers each of the 11 required plan elements as specified in 29 CFR 1910.120 or equivalent state regulations. Table A-1 lists the sections of this plan which apply to each of these required elements. When used together with the Hart Crowser General H&S Plan, this site-specific plan meets all applicable regulatory requirements.

Table A-1 - Location of Required Health and Safety Plan Elements in This Site-Specific H&S Plan

Required H&S Plan Element	Section in this Health and Safety Plan
Confined space entry	2.6 Other Physical Hazards
Decontamination	7.0 Decontamination
Emergency response plan	11.0 Emergency Response Plan
Medical surveillance	12.0 Medical Surveillance
Monitoring program	2.3 Air Monitoring and Action Levels
Names of key personnel	1.3 Chain of Command
Personal protective equipment	3.0 Protective Equipment, 4.0 Safety Equipment List
Safety and hazard analysis	2.0 Hazard Evaluation and Control Measures
Site control	5.0 Exclusion Areas, 9.0 Site Security and Control
Spill containment	10.0 Spill Containment
Training	13.0 Training Requirements

1.2 Distribution and Approval

This H&S Plan will be made available to all Hart Crowser personnel involved in field work on this project. It will also be made available to subcontractors and other non-employees who may need to work on the site. For non-employees, it must be made clear that the plan represents minimum safety procedures and that they are responsible for their own safety while present on site. The plan has been approved by the Hart Crowser Corporate Health and Safety (H&S) Manager. By signing the documentation form provided with this plan (Table A-3 located at the end of plan), project workers also certify their approval and agreement to comply with the plan.

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1.3 Chain of Command

The chain of command for health and safety on this project involves the following individuals:

<u>Project Manager—Howard L. Cumberland</u>

The Project Manager has overall responsibility for the successful outcome of the project. The Project Manager, in consultation with the Corporate H&S Manager, makes final decisions regarding questions concerning the implementation of the site-specific H&S Plan. The Project Manager may delegate this authority and responsibility to the Project and/or Field H&S Managers.

<u>Corporate H&S Manager—David E. Chawes, C.I.H.</u>

The Hart Crowser Corporate H&S Manager has overall responsibility for preparation and modification of this H&S Plan. In the event that health and safety issues arise during site operations, he will attempt to resolve them in discussion with the appropriate members of the project team.

<u>Project H&S Manager—Howard L. Cumberland</u>

The Project H&S Manager has overall responsibility for health and safety on this project. This individual ensures that everyone working on this project understands this H&S Plan. This individual will maintain liaison with the Hart Crowser Project Manager so that all relevant health and safety issues are communicated effectively to project workers.

<u>Field H&S Manager—John Herzog</u>

The Field H&S Manager is responsible for implementing this H&S Plan in the field. This individual also observes subcontractors to verify that they are following these procedures, at a minimum. The Field H&S Manager will also assure that proper protective equipment is available and used in the correct manner, decontamination activities are carried out properly, and that employees have knowledge of the local emergency medical system should it be necessary.

1.4 *Site Work Activities*

The following work task will be accomplished:

- Collection of sediment cores and grab samples
- Collection of water samples

1.5 *Site Description*

The site is composed of a river freight terminal.

2.0 HAZARD EVALUATION AND CONTROL MEASURES

2.1 *Toxicity of Chemicals of Concern*

Based on previous site information and knowledge of the types of activities conducted at this location, the following chemicals may be present at this site: PAHs, metals.

Health hazards of these chemicals are discussed below. This information covers potential toxic effects which might occur if relatively significant acute and/or chronic exposure were to happen. This information does <u>not</u> mean that such effects will occur from the planned site activities. In general, the chemicals, which may be encountered at this site, are not expected to be present at concentrations that could produce significant exposures. The types of planned work activities and use of monitoring procedures and protective measures will limit potential exposures at this site.

These standards are presented using the following abbreviations:

PEL Permissible exposure limit.

TWA Time-weighted average exposure limit for any 8-hour work shift.

STEL Short-term exposure limit expressed as a 15-minute time-weighted average and not to be exceeded at any time during a work day.

<u>Polycyclic Aromatic Hydrocarbons (PAHs)</u>

Exposure to PAHs can occur via inhalation of vapors, ingestion, and skin and eye contact. Skin contact can result in reddening or corrosion. Ingestion can cause nausea, vomiting, blood pressure fall, abdominal pain, convulsions, and coma. Damage to the central nervous system can also occur. The U.S. Department of Health and Human Services (1989) has classified 15 PAHs compounds as having sufficient evidence for carcinogenicity, while the U.S. EPA (1990) has classified at least five of the identified PAHs as human carcinogens. There are no currently assigned PEL-TWA for PAHs, but the closely related material coal tar is listed as coal tar pitch volatiles with a PEL-TWA of 0.2 mg/m^3.

Arsenic

Arsenic is toxic by inhalation and ingestion of dusts and fumes or by inhalation of arsine gas. Trivalent arsenic compounds are the most toxic to humans, with significant corrosive effects on the skin, eyes, and mucous membranes. Dermatitis also frequently occurs, and skin sensitization and contact dermatitis may result from arsenic trioxide or pentoxide. Trivalent arsenic interacts with a number of sulfhydryl proteins and enzymes, altering their normal biological function. Ingestion of arsenic can result in fever, anorexia, cardiac abnormalities, and neurological damage. Liver injury can accompany chronic exposure. Skin and inhalation exposure to arsenic has been associated with cancer in humans, particularly among workers in the arsenical-pesticide industry or copper smelters. The EPA currently classifies arsenic as a Class A, or confirmed, human carcinogen. Arsine is a highly toxic gaseous arsenical, causing nausea, vomiting, and hemolysis. The current PEL-TWA for organic and inorganic forms of arsenic is 0.01 mg/m^3.

Nickel

Nickel exposure can occur via inhalation of dust or fume, ingestion, and eye and skin contact. Nickel and its compounds are irritating to the eye and mucous membranes, and skin exposure frequently leads to sensitization and a chronic eczema referred to as "nickel itch." Elemental nickel and nickel salts are considered probable carcinogens via inhalation, and nickel carbonyl is clearly recognized as a human carcinogen. Animal studies have demonstrated health effects on the kidneys, liver, brain, and heart muscle. The current PEL-TWA for soluble nickel and insoluble nickel are 0.1 and 1.0 mg/m^3, respectively. The PEL-TWA for nickel carbonyl is 0.007 mg/m^3 as nickel.

Lead

Inorganic Lead. Inorganic lead exposure can occur via inhalation of dusts or metal fumes, ingestion of dusts, and skin and eye contact. The principal target organs of lead toxicity include the nervous system, kidneys, blood, gastrointestinal, and reproductive systems. Generalized symptoms of lead exposure include decreased physical fitness, fatigue, sleep disturbances, headaches, bone and muscle pain, constipation, abdominal pain, and decreased appetite. More severe exposure can result in anemia, severe gastrointestinal disturbance, a "lead-line" on the gums, neurological symptoms, convulsions, and death.

Neurological effects are among the most severe of inorganic lead's toxic effects and vary depending on the age of individual exposed. Effects observed in adults occur primarily in the peripheral nervous system, resulting in nerve destruction and degeneration. Wrist-drop and foot-drop are two characteristic manifestations of this toxicity.

The EPA also currently lists inorganic lead as a Group B2 probable human carcinogen via the oral route. This conclusion is based on feeding studies conducted in laboratory animals. The current PEL-TWA for inorganic lead is 0.05 mg/m^3. Occupational exposure to lead is also specifically regulated under WAC 296-62-07521, with an action level established at 0.03 mg/m^3 that triggers monitoring and other requirements.

Organo-Lead Compounds. The most notable organo-lead compounds are tetraethyl (TEL) and tetramethyl lead (TML). These chemicals are colorless liquids which have been used principally as anti-knock compounds in gasoline. When used as such, they are generally mixed with soluble dyes for identification purposes. In the environment, TEL is reported to decompose under sunlight to form crystals of mono-, di-, and triethyl lead compounds, which have a characteristic garlic-like odor.

TEL and TML can be toxic via inhalation, ingestion, percutaneous absorption, and skin and eye contact. Major target organs include the kidneys and the nervous, gastrointestinal, and cardiovascular systems. TEL is irritating to the eyes, and its decomposition products may be inhaled as dust, leading to irritation of the upper respiratory tract and convulsive sneezing. The dusts may also cause itching, burning, and redness of eyes and mucous membranes.

TEL and TML are also readily absorbed into the nervous system and are considerably more neurotoxic than inorganic lead. Minor intoxication by TEL or TML can result in nervous excitation, insomnia, and gastrointestinal symptoms.

The most notable symptom of TEL poisoning and repeated exposure is encephalopathy (disease of the brain), characterized by symptoms of anxiety, delirium with hallucinations, delusions, convulsions, and acute psychosis. In contrast to inorganic lead intoxication, peripheral nerve damage is not observed. The current PEL-TWA for both TEL and TML is 0.075 mg/m^3 as lead.

Zinc

Zinc compounds can be hazardous by inhalation of dust and fumes, ingestion, and skin and eye contact. Zinc chloride is corrosive to skin and mucous membranes, and sensitization can occur resulting in dermatitis. Eye contact can produce inflammation and corneal ulceration. Ingestion can result in corrosive damage to the digestive tract. The current PEL-TWA for exposure to zinc chloride fume is 1 mg/m^3. Zinc chromate exhibits potential carcinogenic effects and is currently limited with a PEL-TWA of 0.05 mg/m^3. Zinc oxide is toxic via inhalation of fumes and dusts and may cause dermatitis. The current PEL-TWA for zinc oxide is 10 mg/m^3 as total dust and 5 mg/m^3 as the respirable fraction.

2.2 Potential Exposure Routes

Inhalation

Exposure via this route could occur if dusts become airborne during site activities. This is unlikely given the wet nature of the sediment cores.

Skin Contact

Exposure via this route could occur if contaminated sediments contact the skin or clothing. Protective clothing and decontamination activities specified in this plan will minimize the potential for skin contact with the contaminants.

Ingestion

Exposure via this route could occur if individuals eat, drink or perform other hand-to-mouth contact in the contaminated (exclusion) zones. Decontamination procedures established in this plan will minimize the inadvertent ingestion of contaminants.

2.3 Air Monitoring and Action Levels

Air monitoring will not be conducted based on the low potential for airborne dusts.

2.4 Fire and Explosion Hazard

Potentially explosive conditions are unlikely to be encountered. Field monitoring equipment will not be necessary to determine the percent of the lower explosive limit (LEL).

An ABC dry chemical fire extinguisher with a minimum charge of 10 pounds shall be a part of the sampling equipment brought to the site. Observe basic precautions such as no smoking or creation of sparks or open flames.

2.5 Cold Stress

Cold stress, or hypothermia, can result from abnormal cooling of the core body temperature.

Signs of Hypothermia

Hypothermia can result from abnormal cooling of the core body temperature. It is caused by exposure to a cold environment, and wind-chill as well as wetness or water immersion can play a significant role. The following discusses signs and symptoms as well as treatment for hypothermia.

Typical warning signs of hypothermia include fatigue, weakness, incoordination, apathy, and drowsiness. A confused state is a key symptom of hypothermia. Shivering and pallor are usually absent, and the face may appear puffy and pink. Body temperatures below 90° F require immediate treatment to restore temperature to normal.

Treatment of Hypothermia

Current medical practice recommends slow rewarming as treatment for hypothermia, followed by professional medical care. This can be accomplished by moving the person into a sheltered area and wrapping with blankets in a warm room. In emergency situations where body temperature falls below 90° F

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and heated shelter is not available, use a sleeping bag, blankets and/or body heat from another individual to help restore normal body temperature.

2.6 Other Physical Hazards

Trips/Falls

As with all field work sites, caution will be exercised to prevent slips on rain slick surfaces, stepping on sharp objects, etc. Care will be taken not to fall off the boat.

Noise

Appropriate hearing protection (ear muffs or ear plugs with a noise reduction rating of at least 25 dB) will be used for individuals working near an active drill rig or other high-noise generating equipment.

2.7 Hazard Analysis and Applicable Safety Procedures by Task

The work tasks and associated hazards, which may be anticipated during the operations described elsewhere in this work plan, and suitable control measures are presented in Table A-2.

Table A-2 - Hazard Analysis by Task

Work Task	Hazards	Protective Measures
Site reconnaissance	None anticipated	Level D PPE
Sample collection	Splashes, skin contact, inhalation	Level D PPE

Sediment Sampling

All sampling activities will be conducted under the assumption that the media is contaminated and appropriate personnel protection will be required.

T4T900002591

3.0 PROTECTIVE EQUIPMENT

Workers performing general site activities where skin contact with free product or contaminated materials is not likely and inhalation risks are not expected will wear regular work clothes or rain suit, eye protection, hard hat, nitrile or neoprene-coated work gloves (as required), and safety boots.

4.0 SAFETY EQUIPMENT LIST

The following Safety Equipment must be available on site:

- Fire Extinguisher - 10 lb ABC
- First Aid Kit
- Eye Wash Kit
- Mobile Telephone
- Hard Hat
- PVC (or similar) rainsuit
- Neoprene Steel-Toed Boots
- Neoprene Outer Gloves/Nitrile or Latex Inner Gloves

5.0 EXCLUSION AREAS

If migration of chemicals from the work area is a possibility, or as otherwise required by regulations or client specifications, site control will be maintained by establishing clearly identified work zones. These will include the exclusion zone, contaminant reduction zone, and support zone, as discussed below.

5.1 Exclusion Zone

Exclusion zones will be established around the sample collection work area on the boat. Only persons with appropriate training and authorization from the Field H&S Manager will enter this area while work is being conducted there.

5.2 Contamination Reduction Zone

A contamination reduction zone will be established just outside the temporary exclusion zone to decontaminate equipment and personnel as discussed below. This zone will be clearly delineated from the exclusion zone and support zone. Care will be taken to prevent the spread of contamination from this area.

5.3 *Support Zone*

A support zone will be established outside the contamination reduction area to stage clean equipment, don protective clothing, take rest breaks, etc. This zone will be clearly delineated from the contaminant reduction zone using the means noted above.

6.0 MINIMIZATION OF CONTAMINATION

To make the work zone procedure function effectively, the amount of equipment and number of personnel allowed in contaminated areas must be minimized. In addition, the amounts of soil, water, or other media collected should not exceed what is needed for laboratory analysis and record samples. Do not kneel on contaminated ground, stir up unnecessary dust, or perform any practice that increases the probability of hand-to-mouth transfer of contaminated materials. Use plastic drop cloths and equipment covers where appropriate. Eating, drinking, chewing gum, smoking, or using smokeless tobacco are forbidden in the exclusion zone.

7.0 DECONTAMINATION

Decontamination is necessary to limit the migration of contaminants from the work zone(s) onto the site or from the site into the surrounding environment. Figure A-5 presents a layout for conducting decontamination within the sites zones discussed previously. Equipment and personnel decontamination are discussed in the following sections, and the following types of equipment will be available to perform these activities:

- Boot and Glove Wash Bucket and Rinse Bucket
- Scrub Brushes - Long Handled
- Spray Rinse Applicator
- Plastic Garbage Bags
- 5-Gallon Container Alkaline Decon Solution

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FIGURE A-5 - DECONTAMINATION LAYOUT

EXCLUSION ZONE

"HOT LINE"

	↓	Wash and Rinse Gloves and Boot Covers
Waste Water to Barrels	1	Remove and Dispose Disposable Equipment
	↓	
Waste Water to Barrels	2	Wash and Rinse Inner Gloves and Boots
	↓	
Plastic Bag for Transport Clean and Reuse	3	Remove Respirator
	↓	
Plastic Bag for Transport/Disposal	4	Remove Inner Gloves and Boots
	↓	

CONTAMINATION CONTROL LINE

SUPPORT ZONE

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7.1 *Equipment Decontamination*

Proper decontamination (decon) procedures will be employed to ensure that contaminated materials do not contact individuals and are not spread from the site. These procedures will also ensure that contaminated materials generated during site operations and during decontamination are managed appropriately.

All non-disposable equipment will be decontaminated in the contamination reduction zone. Prior to demobilization, all contaminated portions of heavy equipment should be thoroughly cleaned. Heavy equipment may require steam cleaning. Soil and water sampling instruments should be cleaned with detergent solutions in portable buckets.

7.2 *Personnel Decontamination*

Personnel working in exclusion zones will perform decontamination in the contamination reduction zone prior to taking rest breaks, drinking liquids, etc. The following describes the procedures for decon activities.

Mini-decon Procedure:

1. In the contamination reduction zone, wash and rinse gloves and boots in portable buckets.
2. Remove protective suit.
3. Remove work boot and gloves. Inspect and discard if ripped or damaged.
4. Remove respirator (if worn) and clean off sweat and dirt using premoistened towelettes. Deposit used cartridges in plastic bag.

Full Decontamination Procedure:

1. In the contamination reduction zone, wash and rinse outer gloves and boots in portable buckets.
2. Remove outer gloves and protective suit and deposit in labeled container for disposable clothing.
3. Remove respirator, and place used respirator cartridges (if end of day) in container for disposable clothing.
4. If end of day, thoroughly clean respirator and store properly.
5. Remove inner gloves and discard into labeled container for disposable clothing.

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6. Remove work boots without touching exposed surfaces, and put on street shoes. Put boots in individual plastic bag for later reuse.
7. Immediately wash hands and face using clean water and soap.
8. Shower as soon after work shift as possible.

8.0 DISPOSAL OF CONTAMINATED MATERIALS

All disposable sampling equipment and materials will be placed inside of a 6 mil polyethylene bag or other appropriate container. Disposable supplies will be removed from the site with the personnel.

9.0 SITE SECURITY AND CONTROL

Site security and control will be the responsibility of the Project Manager. The "buddy-system" will be used when working in designated hazardous areas. Any security or control problems will be reported to appropriate authorities.

10.0 SPILL CONTAINMENT

Sources of bulk chemicals subject to spillage are not expected to be encountered in this project. Accordingly, spill containment plan is not required for this project.

11.0 EMERGENCY RESPONSE PLAN

The Hart Crowser Emergency Response Plan outlines the steps necessary for appropriate response to emergency situations. The following paragraphs summarize the key Emergency Response Plan procedures for this project.

11.1 Plan Content and Review

The principal hazards addressed by the Emergency Response Plan include the following: fire or explosion, medical emergencies, uncontrolled contaminant release, and situations such as the presence of chemicals above exposure guidelines or inadequate protective equipment for the hazards present. However, in order to help anticipate potential emergency situations, field personnel shall always exercise caution and look for signs of potentially hazardous situations, including the following as examples:

- Visible or odorous chemical contaminants;
- Drums or other containers;
- General physical hazards, slippery or uneven surfaces, etc.);
- Live electrical wires or equipment; and
- Underwater pipelines or cables.

These and other potential problems should be anticipated and steps taken to avert problems before they occur.

The Emergency Response Plan shall be reviewed and rehearsed, as necessary, during the on-site health and safety briefing. This ensures that all personnel will know what their duties shall be if an actual emergency occurs.

11.2 Plan Implementation

The Field H&S Manager shall act as the lead individual in the event of an emergency situation and evaluate the situation. He/she will determine the need to implement the emergency procedures, in concert with other resource personnel including client representatives, the Project Manager, and the Corporate H&S Manager. Other on-site field personnel will assist the Field H&S Manager as required during the emergency.

In the event that the Emergency Response Plan is implemented, the Field H&S Manager or designee is responsible for alerting all personnel at the affected area by use of a signal device (such as a hand-held air horn) or visual or shouted instructions, as appropriate.

Emergency evacuation routes and safe assembly areas shall be identified and discussed in the on-site health and safety briefing, as appropriate. The buddy-system will be employed during evacuation to ensure safe escape, and the Field H&S Manager shall be responsible for roll call to account for all personnel.

11.3 Emergency Response Contacts

Site personnel must know whom to notify in the event of Emergency Response Plan implementation. The following information will be readily available at the site in a location known to all workers:

- Emergency Telephone Numbers: see list at the beginning of this plan;
- Route to Nearest Hospital: see list and route maps (Figure A-1 through A-4) at the beginning of this plan;
- Site Descriptions: see the description at the beginning of this plan; and
- If a significant environmental release of contaminants occurs, the federal, state, and local agencies noted in this plan must be immediately notified. If the release to the environment includes navigable waters also notify:

  National Response Center at (800) 424-8802
  EPA at (908) 321-6660

In the event of an emergency situation requiring implementation of the Emergency Response Plan (fire or explosion, serious injury, tank leak or other material spill, presence of chemicals above exposure guidelines, inadequate personnel protection equipment for the hazards present, etc.), cease all work immediately. Offer whatever assistance is required, but do not enter work areas without proper protective equipment. Workers not needed for immediate assistance will decontaminate per normal procedures (if possible) and leave the work area, pending approval by the Field H&S Manager for restart of work. The following general emergency response safety procedures should be followed.

11.4 Fires

Hart Crowser personnel will attempt to control only very small fires. If an explosion appears likely, evacuate the area immediately. If a fire occurs which cannot be controlled with the 10-pound ABC fire extinguisher located in the field equipment, then immediate intervention by the local fire department or other appropriate agency is imperative. Use these steps:

- Evacuate the area to a previously agreed upon, upwind location;
- Contact fire agency identified in the site specific plan; and
- Inform Project Manager or Field H&S Manager of the situation.

11.5 Medical Emergencies

Contact the agency listed in the site-specific plan if a medical emergency occurs. If a worker leaves the site to seek medical attention, another worker should accompany the patient. When in doubt about the severity of an accident or exposure, always seek medical attention as a conservative approach. Notify the

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Project Manager of the outcome of the medical evaluation as soon as possible. For minor cuts and bruises, an on-site first aid kit will be available.

- If a worker is seriously injured or becomes ill or unconscious, immediately request assistance from the emergency contact sources noted in the site-specific plan. Do not attempt to assist an unconscious worker in an untested or known dangerous confined space without applying confined space entry procedures.

11.6 Uncontrolled Contaminant Release

In the event of a hazardous material spill, attempt to stop and contain the flow of material using absorbents, booms, dirt, or other appropriate material. Prevent migration of liquids into streams or other bodies of water by building trenches, dikes, etc. Drum the material for proper disposal or contact a spill removal firm for material cleanup and disposal, as required. Observe all fire and explosion precautions while dealing with spills.

11.7 Potentially High Chemical Exposure Situations/Inadequate Protective Equipment

In some emergency situations, workers may encounter localized work areas where exposure to previously unidentified chemicals could occur. A similar hazard includes situations where chemicals are present above permissible exposure levels and/or above the levels suitable for the personnel protective equipment at hand on-site. If these situations occur, immediately stop work and evacuate the work area. Do not reenter the area until appropriate help is available and/or appropriate personnel protective equipment is obtained. Do not attempt to rescue a downed worker from such areas without employing confined space entry procedures. Professional emergency response assistance (fire department, HAZMAT team, etc.) may be necessary to deal with this type of situation.

11.8 Other Emergencies

Depending on the type of project, other emergency scenarios may be important at a specific work site. These scenarios will be considered as part of the site-specific plan and will be discussed during the on-site safety briefing, as required.

11.9 Plan Documentation and Review

The Field H&S Manager will notify the Project H&S Manager as soon as possible after the emergency situation has been stabilized. The Project Manager or H&S Manager will notify the appropriate client contacts, and regulatory agencies, if applicable. If an individual is injured, the Field H&S Manager or designate will file a detailed Accident Report with the Corporate H&S Manager within 24 hours.

The Project Manager and the Field, Project, and Corporate H&S Managers will critique the emergency response action following the event. The results of the critique will be used in follow-up training exercises to improve the Emergency Response Plan.

12.0 MEDICAL SURVEILLANCE

A medical surveillance program has been instituted for Hart Crowser employees having exposure to hazardous substances. Exams are given before assignment, annually thereafter, and upon termination. Content of exams is determined by the Occupational Medicine physician in compliance with applicable regulations and is detailed in the General H&S Plan.

Each team member will have undergone a physical examination as noted above in order to verify that he/she is physically able to use protective equipment, work in hot environments, and not be predisposed to occupationally induced disease. Additional exams may be needed to evaluate specific exposures or unexplainable illness.

13.0 TRAINING REQUIREMENTS

Hart Crowser employees who perform site work must understand potential health and safety hazards. All employees potentially exposed to hazardous substances, health hazards, or safety hazards will have completed 40 hours of off-site initial hazardous materials health and safety training or will possess equivalent training by past experience. They will also have a minimum of three days of actual field experience under the direct supervision of a trained supervisor. All employees will have in their possession evidence of completing this training. Employees will also complete annual refresher, supervisor, and other training as required by applicable regulations.

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Prior to the start of each work day, the Field H&S Manager will review applicable health and safety issues with all employees and subcontractors working on the site, as appropriate. These briefings will also review the work to be accomplished, with an opportunity for questions to be asked.

14.0 REPORTING, REPORTS, AND DOCUMENTATION

The Field Health and Safety Report will be completed daily by the Hart Crowser Field Health and Safety Manager or designated individual. In the event that accidents or injuries occur during site work, the Project Manager will be informed, who will notify the client immediately. Hart Crowser staff and subcontractors on this site will sign the Record of H&S Communication document (Table A-3), which will be kept on site during work activities and recorded in the project files.

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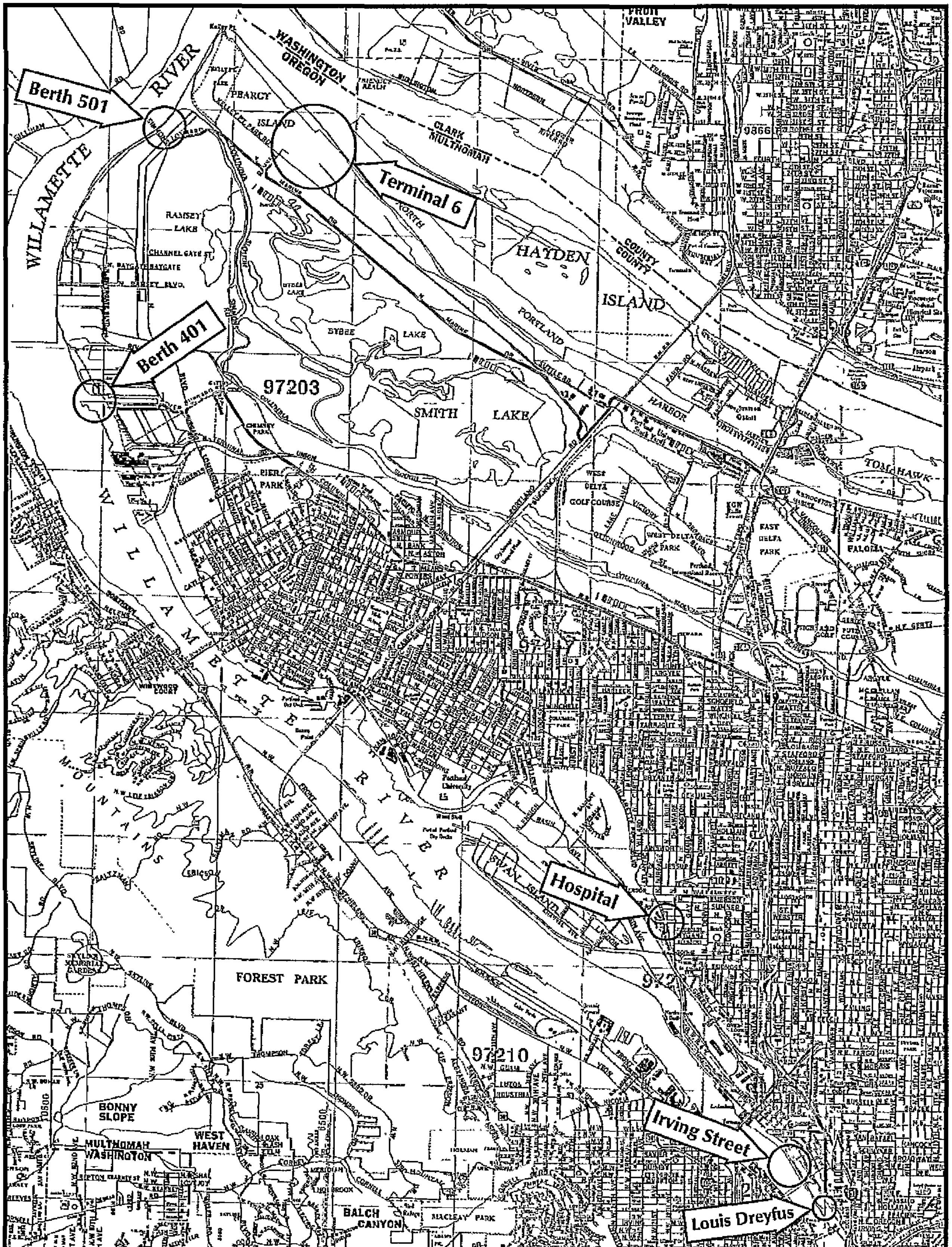
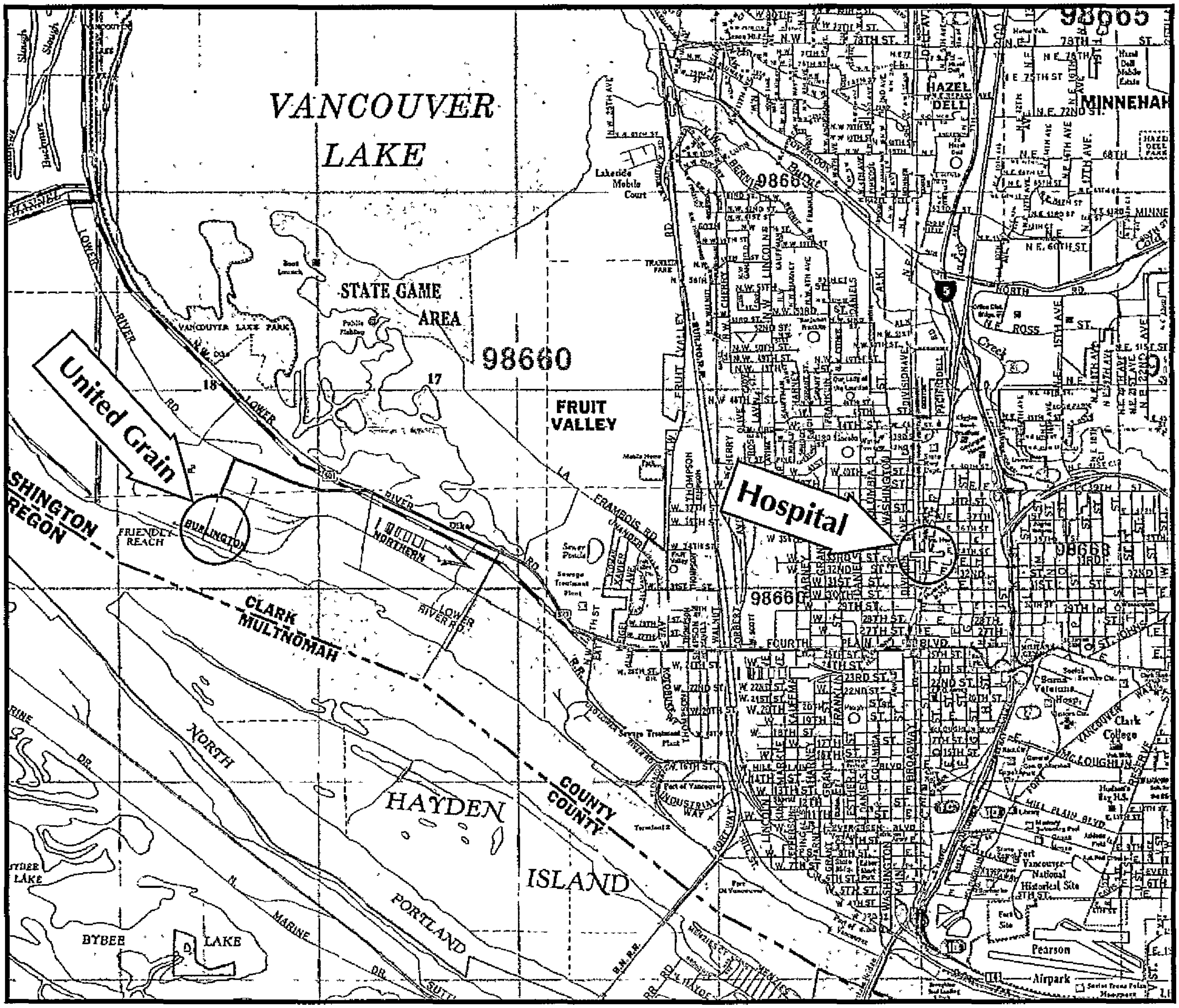
Route to Hospital Map
Portwide Sampling Project



Note: Base map prepared from a Rand McNally, Portland, Oregon City Map.

HARTCROWSER
J-5760 8/98
Figure A-1

Route to Hospital Map
Portwide Sampling Project



Note: Base map prepared from a Rand McNally, Portland, Oregon City Map.

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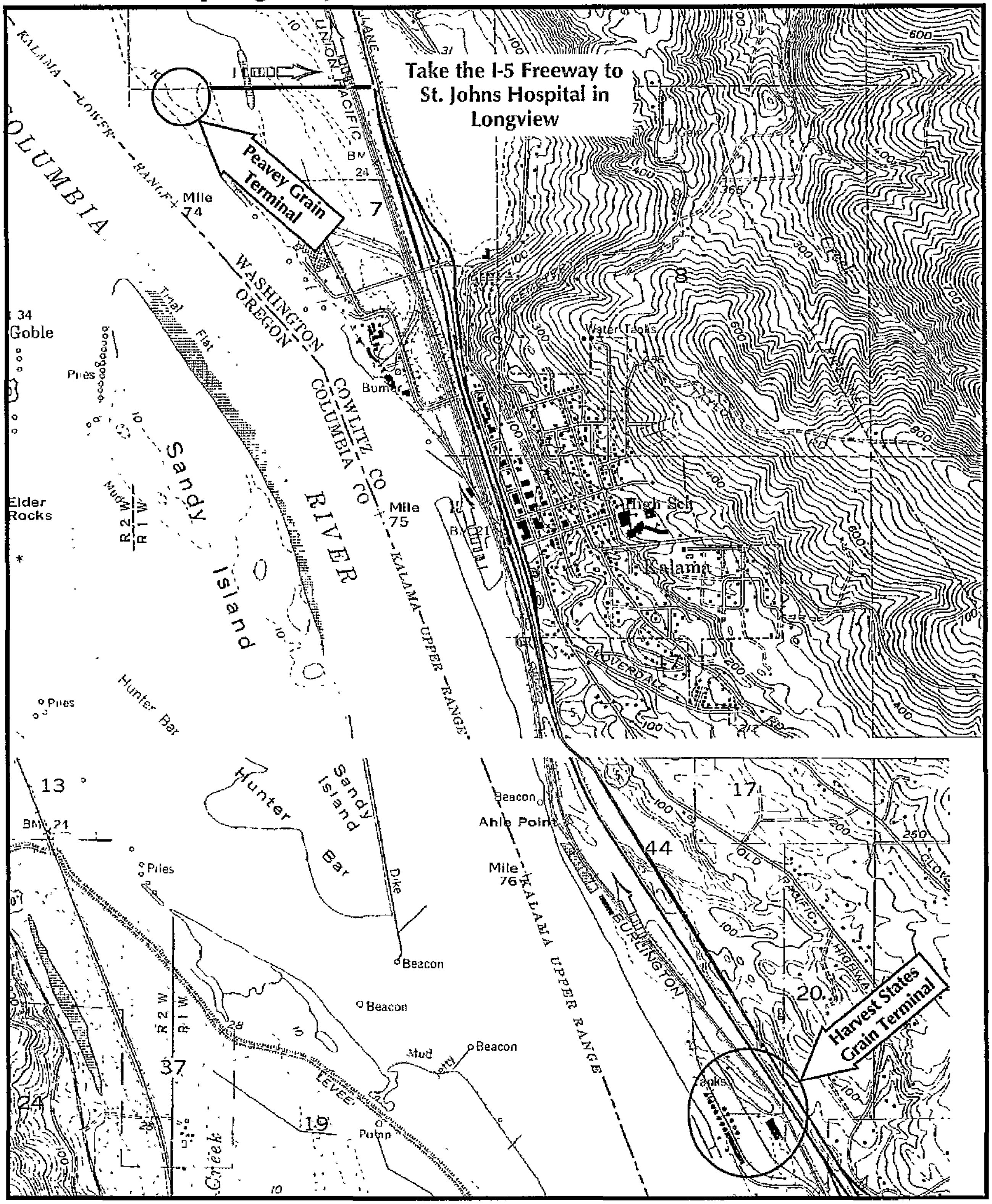
Figure A-2

T4T900002603

Route to Hospital Map

Portwide Sampling Project



Note: Base map prepared from the USGS 7.5-minute quadrangle of Kalama, Washington.

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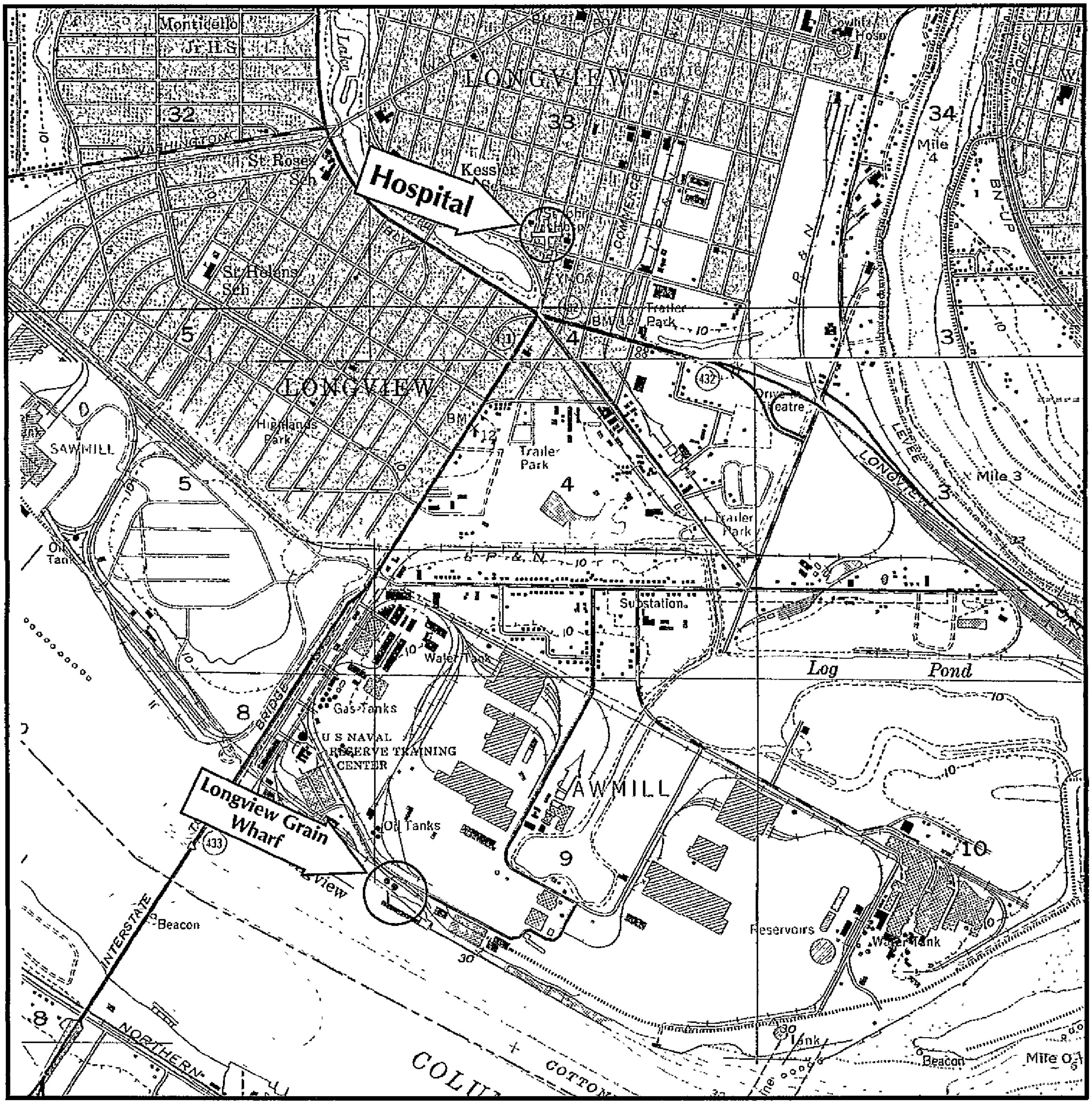
Figure A-3

Route to Hospital Map
Portwide Sampling Project



Note: Base map prepared from the USGS 7.5-minute quadrangle of Longview, Washington.

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Figure A-4

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Earth and Environmental Technologies

Hart Crowser, Inc.
Five Centerpointe Drive, Suite 240
Lake Oswego, Oregon 97035-8652
Fax 503.620.6918
Tel 503.620.7284

Letter of Transmittal

To:	Port of Portland	Date:	September 3, 1998
	PO Box 3529		
	Portland, Oregon 97208	Job No:	5760
Attn:	Mr. Sebastian Degens		
Re:	Portwide Sampling Project		

We are sending the following items:

Date	Copies	Description
9/3/98	1	Sampling and Analysis Plan
		Sediment Testing for Full Characterization of
		Proposed Dredged Material
		Longview, Kalama, and Vancouver, Washington and
		Portland, Oregon
		Port Project No. 51773-220

These are transmitted:

- ☐ For your information
- ☐ For action specified below
- ☐ For review and comment
- ☐ For your use
- ☐ As requested

Remarks

Copies to:	John Melek, EPA (1 copy)	By:	Howard L Cumberland
Mark Siipola, ACOE (1 copy)			Howard L. Cumberland
Tom Rosetta, DEQ (1 copy)		Title:	Senior Project Manager

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